HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution Affiliated to Anna University, Chennai)

(Approved by AICTE, New Delhi, Accredited by NAAC with 'A' Grade)

COIMBATORE 641 032

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.E CSE- CURRICULUM AND SYLLABUS

REGULATIONS 2016

Common to all B.E. / B.Tech. DEGREE PROGRAMMES

(CHOICE BASED CREDIT SYSTEM)

INDEX

REGULATION – 2016

B.E. COMPUTER SCIENCE AND ENGINEERING

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REGULATION- 2016

B. E COMPUTER SCIENCE AND ENGINEERING

VISION

To provide an excellence for individuals to develop technologically superior socially conscious and nationally responsible citizens

MISSION

- To develop competent Computer Science and Engineering professionals with knowledge in current technology.
- To mould them to attain excellent leadership qualities there by making them excel in their careers.
- To inspire and nurture students to come out with innovation and creativity solutions meeting the societal needs.

SALIENT FEATURES OF THE SYLLABUS

1. **"Technical Presentation"** is added in the V semester

   Now a day everything is getting advanced every second of time. Every day starts with something new. Whatever be the field, everything is getting advanced. Lots of researches and studies are carried out in various subjects around the world. These updates on various fields cannot be included in the student curriculum. The students have to always keep their eyes on what new things are arriving day by day. Hence students' knowledge in the current innovative field is kindled through the technical seminars.

2. **"Miniproject"** is added in the VI semester

   Students can be motivated to do some innovation application oriented mini-projects with the knowledge obtained till VI semester.

3. **"Free open source software I"** is added in the V and **"Free open source software II"** is added in the VI semester.

4. **"Internet of Things"** subject is added in the VI semester.

   The Internet of Things (IoT) is one of the hottest topics in the technology sector, and with good reason. It influences the interaction of technological, economic, social, societal, and individual changes, and analysts and market researchers estimate that by the year 2020.

5. **Open Elective** subjects are included in the VI and VII semesters, so that students can choose any interested subjects from other departments, which improve their inter-disciplinary subject knowledge.

6. **" R Programming" Language is included in the Elective list**

   The R language is very useful in the field of statistical computation and data science. It offers various techniques like clustering, time-series analysis and classification technique, nonlinear/linear modeling and classical statistical tests. Also, this language is very adaptable and extensible. Along with these, it supports many graphical techniques too.

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: 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. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To acquire knowledge in the latest technologies and innovations and an ability to identify, analyze and solve problems in computer engineering.

PEO2: To be capable of modeling, designing, implementing and verifying a computing system to meet specified requirements for the benefit of society.

PEO3: To possess critical thinking, communication skills, teamwork, leadership skills and ethical behavior necessary to function productively and professionally.

REGULATIONS 2016
B.E. / B.Tech. DEGREE PROGRAMMES
(CHOICE BASED CREDIT SYSTEM)

The regulations hereunder are effective from the academic year 2016 - 2017 and applicable to students admitted in Hindusthan College of Engineering and Technology, an Autonomous Institution Affiliated to Anna University, Chennai. The regulations are subject to amendments as may be made by the Academic Council of the Institution from time to time. Any or all such amendments will be effective from such date to such batches of students (including those already in the middle of the programme) as may be decided by the Academic Council.

1. PRELIMINARY DEFINITIONS AND NOMENCLATURE

In this Regulation, unless the context otherwise specifies

i. **"Programme"** means Degree Programme, i.e. B.E. / B.Tech. Degree Programme.

ii. **Choice Based Credit System :** The choice based credit system provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning.

iii. **"Branch"** means specialization or discipline of B.E. / B.Tech. Programme like Civil Engineering, Mechanical Engineering, Electrical Engineering, etc.

iv. **"Course"** means a theory or practical subject like Mathematics, Physics, Engineering Graphics, etc. that is normally studied in a semester.

v. **"Head of the Institution"** and "**Chairman- Academic Council**" mean the Principal of the College.

vi. **"Head of the Department"- HoD** means head of the Department concerned.

vii. **"Controller of Examinations"- CoE** means the authority who is responsible for all activities of the End Semester Examinations.

2. CONDITIONS FOR ADMISSION

Students seeking admissions (Both regular and lateral entry) to the B.E. / B.Tech. Degree Programmes will be required to satisfy the conditions of admission thereto prescribed by the Anna University, Chennai and the Government of Tamilnadu.

3. MEDIUM OF INSTRUCTION

The medium of instruction is English for all courses, examinations, seminar presentations and project / thesis / dissertation reports.

4. DURATION OF THE PROGRAMME

The duration of the B.E. / B.Tech. Programme is 4 years (8 semesters). A student is expected to complete the B.E. / B.Tech. Programme in 4 years (8 semesters). But in any case the maximum duration allowed to complete the programme is 7 years (14 semesters) for HSc students and 6 years (12 semesters) for Lateral Entry students.

Each semester will normally have 90 working days.

5. BRANCHES OF STUDY

Regular students shall be admitted to one of the following branches of study at the beginning of the First Year and the Lateral Entry students are admitted at the beginning of the Second year (Third Semester). The programme shall procure a Degree of Bachelor of Engineering / Bachelor of Technology of Anna University, Chennai, and would extend over a period of eight semesters spreading over four academic years with two semesters per year for Regular students and six semesters spreading over three academic years for lateral entry students .

Branches of Study

B.E. Programmes

i. Aeronautical Engineering
ii. Automobile Engineering
iii. Civil Engineering
iv. Computer Science and Engineering
v. Electrical and Electronics Engineering
vi. Electronics and Communication Engineering
vii. Electronics and Instrumentation Engineering
viii. Mechanical Engineering
ix. Mechatronics Engineering

B.Tech. Programme

i. Information Technology

6.0. STRUCTURE OF THE PROGRAMMES

Every B.E./B.Tech. Programme will have a curriculum with a syllabi consisting of Theory courses, Practical courses, Theory courses with practical component and Employability Enhancement Courses prescribed by the respective Board of Studies from time to time.

6.1. Categorization of Courses

The following are the broad divisions of the various theory and practical courses:

i) **Humanities and Social Sciences (HS)** courses include Technical English, Professional English, Basic German, Basic French, Employability Skills, Engineering Ethics and Human Values, Life Skills, Communication skills, Engineering Economics and Management.

ii) **Basic Sciences (BS**) courses include Mathematics, Physics, Chemistry, etc.

iii) **Engineering Sciences (ES)** courses include Engineering Practices, Engineering Graphics, Basics of Electrical/Electronics/Civil/Mechanical/Computer Engineering, etc.

iv) **Professional Core (PC)** courses include the core courses relevant to the chosen specialization / branch.

v) **Professional Elective (PE)** courses include the elective courses relevant to the chosen specialization / branch and offered by the respective department.

vi) **Open Elective (OE)** Courses offered by a discipline for students other than the corresponding discipline students.

vii) **Employability Enhancement Courses (EEC)** include Project Work, Internship, Seminar, Professional Practices, Case Study and Industrial training / Practical Training.

6.2. Co-curricular and Extracurricular activities:

All students, on admission, shall enroll in atleast any one of the personality and character development programmes (NCC/NSS/YRC/RSP/Sports and Games) and undergo mandatory training for 40 hours during the course of the programme.

i) National Cadet Corps (NCC) - will have parades & drill practice

ii) National Service Scheme (NSS) - will have social service activities in and around the Institution.

iii) Youth Red Cross (YRC) - will have activities related to social service.

iv) Road Safety Patrol (RSP) - will help the traffic movement in front of the college and at other places.

v) Sports and Games - will have sports, games, and physical exercises.

6.3.Electives: Every student shall opt electives from the list of electives related to his/her degree programme in consultation with the Faculty Advisor and the Head of the Department.

A student has to study **8 elective courses** (**6 electives from the list of Professional Electives and 2 from the list under Open Electives**). Open Elective Courses are offered in 6th and 7th semesters and Professional Elective courses from 5th semester to the 8th semester.

6.4. Online courses

A student has a choice to study online courses conducted by agencies such as state and central government educational institutions like IIT, Anna University and other reputed universities, edX etc, for which certificates are provided by the agencies offering the courses.

6.5. Self- Study Courses

A student can opt for self- study courses, provided the student does not have current arrears and has earned a CGPA of 8.0 and above. **The self-study course must be an elective course listed in the curriculum but it is not taught by the department in the semester.** The purpose of the self - study course is to permit the student to study an elective of his/her choice.

6.6.Project work

Every student is required to undertake a suitable project work in Industry / Department in consultation with the faculty Supervisor and Head of the Department and submit the project report on dates announced by the Department/College

6.7. Fast track programme

In order to provide opportunity to students who maintain a CGPA of 8 and upto fourth semester for regular category students / third and fourth semesters for lateral students without history of arrears to undergo full time industrial training / internship / industry project in India / abroad during the eight semester of the programme can opt for the fast track programme from fifth semester. The elective/theory courses of the eight semester can be studied under the guidance of a faculty apart from the regular class hours one course each from fifth semester onwards. The student is evaluated for 25 marks as per the CIA components mentioned in 15.1(ii), whereas attendance 5 marks are clubbed with assignment (i.e. Assignment 10 marks). He / She has to register that course for ESE along with the other courses of the semester.

7.0. NUMBER OF COURSES PER SEMESTER

Each semester curriculum shall normally have a maximum of SEVEN theory courses and THREE practical courses. Each course will have credits as assigned.

8.0. CREDIT ASSIGNMENT

Each course is assigned certain number of credits based on the following:

Contact period per week	Credit
1 Lecture Period	1
1 Tutorial Periods	1
2 Practical Periods	1
2 Project Periods	1
2 Seminar Periods	1

9.0. CREDIT DISTRIBUTION FOR THE CATEGORY OF COURSES:

S.No	Classification	Total Number Credits
1	Humanities and Social Sciences	10-13
2	Basic Sciences	26-32
3	Engineering Sciences and Technical Drawings	18-23
4	Professional core	80-92
5	Professional Electives	18
6	Open Electives	6
7	Employability Enhancement Courses	13 – 18
	Total	**187**

10.0. TOTAL CREDITS TO BE EARNED FOR THE AWARD OF DEGREE

For the award of degree, a student admitted in a regular stream has to earn a certain minimum number of credits specified in the curriculum of the respective branch of study. The minimum number of credits to be earned for the award of degree is 187. For Lateral entry students, the minimum number of credits shall not be less than 135.

11.0. EXTRA CREDITS

A UG student can earn maximum of **SEVEN extra credits** other than the total credits required for obtaining a degree during the course of study out of which **FIVE** from one credit courses / online courses / self study courses and **TWO** from co-curricular and / or extra-curricular activities.

11.1. One credit courses

A student can study **one credit courses** offered by his / her department / other departments / External Agencies (offering Certificate Courses).

Note: Course offered by the external agencies are assessed by the department academic committee (DAC) and the same is to be recommended to the Chairman, Academic Council for the award of one credit.

12.0. WEIGHTAGE OF ASSESSMENT COMPONENTS OF A COURSE

Performance in each course of study shall be evaluated based on

- **i.** Continuous Internal Assessments (CIA) throughout the semester and
- **ii.** End Semester Examination (ESE) at the end of the semester.

For Theory Courses out of 100 marks, the maximum marks for CIA is fixed as 25 and the End ESE carries 75 marks. For Laboratory Courses out of 100 marks, the maximum marks for CIA is fixed as 50 and ESE carries 50 marks.

S.No	Category of courses	CIA	ESE
1	Theory Courses	25	75
2	Laboratory Courses	50	50
3	Theory Course with Laboratory component	50	50
4	Mini Project	50	50
5	Industrial Training/ Internship / Technical Seminar	0	100
6	Project Work	100	100

13.0. REQUIREMENTS TO APPEAR FOR THE ESE

A student who has fulfilled the following conditions shall be deemed to have satisfied the requirements for completion of a semester.

i. A student shall be permitted to take the ESE of **any course**, if

a. the student secures not less than 75% of attendance in the course during the semester and
b. the conduct of the student has been satisfactory

ii. A student who has secured attendance between 74% and 65% (both included) in any course, due to medical reasons (Hospitalization / Accident / Specific Illness) or due to participation in University / District / State / National / International Level Sports or due to participation in Seminar / Conference / Workshop / Training Programme / Voluntary Service / Extension Activities or similar programmes with a prior permission taken from the Principal shall be exempted from the above prescribed requirements for attendance and shall be permitted to take the examination on the recommendation of the concerned HoD to condone the lack of attendance.

iii. It is mandatory for the HoD to verify and certify the genuineness of the case before recommending the same to the Principal.

iv. All other students who have secured attendance between 65 % and 74%(both included) upto maximum of three courses shall apply for condonation in the prescribed format with prescribed fee of Rs. 2000 per course so as to permit them to attend the ESE.

v. **A student who has secured less than 65% of attendance in more than three courses of any semester will not be permitted to write any of the current semester courses and also to continue the study in the subsequent semester. But the Student will be permitted to appear for his / her arrear examinations, if any. The student has to redo all the courses of that semester by rejoining the same semester in the subsequent academic year with the approval of the Principal.**

vi. A student shall normally be permitted to appear for the ESE of any semester commencing from I semester if he / she has satisfied the requirements and has registered for ESE examination in all courses of the semester.

vii. **Registration is mandatory for semester examinations as well as arrears examinations failing which the student will not be permitted to move to the higher semester.**

14.0. COURSE ENROLLMENT AND REGISTRATION FOR ESE

- A student shall normally be permitted to appear for ESE of the current semester if he / she has satisfied the semester completion requirements (vide Clause 13.0). Registration is mandatory for current semester examinations as well as arrear examinations, by paying the prescribed fee failing which the candidate will not be permitted to move to the higher semester
- Enrolment for the courses of semesters FIVE to EIGHT will commence twenty working days prior to the last working day of the preceding semester. The students shall enroll for the courses with the guidance of the faculty advisor.
- From FIFTH semester onwards a student has an option to **drop one professional elective course** offered in the semester in order to **study online course / self study course**.
- No student is permitted to undergo online course and self-study simultaneously in a semester.
- A candidate who has already appeared for any course in a semester and passed the examination is not entitled to reappear in the same course for improvement of grades.

15.0. CONTINUOUS INTERNAL ASSESSMENT: The performance of students in each course will be continuously assessed in the following components by the respective faculty as per the guidelines given below:

15.1. Distribution of Marks

(i) Distribution of Marks for Attendance

S. No.	Attendance %	Marks
1	91 and above	5.0
2	86 – 90	4.0
3	81 – 85	3.0
4	75 – 80	2.0
5	Less than 75	0

(ii) Theory Course:

S. No.	Category	Maximum Marks
1.	Assignment/Technical quiz/Presentation	5
2.	Attendance	5
3.	Internal tests (Five marks each for first two higher marks of 3 internal tests and five marks for mid semester examination)	15
	Total	25

(iii) Practical Course:

S. No.	Category	Maximum Marks
1.	Record/observation for the Experiment	5
2.	Experiment and Calculation/ Structure of the Program & Result	15
3.	Viva voce	5
4.	Model Exam	25
	Total	50

(iv) Theory course with Laboratory component:

The maximum marks for CIA shall be 50 in which 25 marks for theory component and 25 marks for practical component. Clause 15.1.(i) is followed for the theory component and 15.1.(ii) is followed for laboratory component whereas marks obtained for 50 is then reduced to 25.

15.2. Question Paper pattern for internal test and Midterm test (Except Engineering Graphics and)

Internal test **Maximum Marks : 50**	**Midterm test** **Maximum Marks : 100**
Part A : 5 x 2 = 10 marks	**Part A** : 10 x 2 = 20 marks
Part B:2x16= 32 marks (Either or Pattern)	**Part B** : 5 x 14 = 70 marks (Either or Pattern)
Part C: 1 x 8 = 8 marks (Either or Pattern)	**Part C** : 1 x 10 = 10 marks (Either or Pattern)

For Engineering Graphics

Internal test **Maximum Marks : 50**	**Midterm test** **Maximum Marks : 100**
5x 10 =50 marks (Either or Pattern)	**5x 20 = 100 marks (Either or Pattern)**

15.3. CIA Marks for Mini Project work and the final Project work.

Refer Clause 16.0. (d) and (e).

15.4. Declaration of the marks of CIA: Mark secured by a student in each evaluation component such as Internal Tests, Assignments, Attendance, etc., shall be timely displayed by the course Faculty. At the end of the semester, course Faculty shall tabulate marks allotted to students for CIA, display it on notice board with the signature of the concerned HoD for students' reference and rectify grievances if any, and then the CIA mark is to be finalized. Course coordinator/ faculty shall enter CIA marks in the Examination Management System (EMS) and display it on notice board and hand over the copy of the same to the Department coordinator/HoD. He/she shall collect the marks for all Courses in all Semesters, compile them semester wise, and hand over the copy of the same to OCoE.

16. ASSESSMENT OF ESE AND PASSING REQUIREMENTS

The courses offered fall under the following categories:

a). Theory courses
b). Laboratory courses
c). Theory courses with Laboratory component
d). Mini Project
e). Project works
f). Internship/Inplant/Implant Training/Technical Seminar

a) Theory Course: ESE will be held at the end of each semester for each course. The question paper is set for a maximum of 100 marks. A student who secures not less than 50% of total marks prescribed for the course (CIA + ESE) with a minimum of 45% of the marks prescribed for the ESE shall be declared to have passed in the examination.

If a student fails to secure a pass in a particular course, it is mandatory that he/she shall register and reappear for the examination in that course when examination is conducted by the OCoE. He/she should continue to register and reappear for the examination till he / she secures a 'pass'.

Note: The CIA marks obtained by a student in the first appearance shall be retained only for three successive appearances. After that, a student has to secure 50% marks in the ESE so as to declare him/her 'pass' in the course concerned.

Question Paper pattern for ESE (Except Engineering Graphics & Mathematics)

Maximum Marks : 100
Part A : 10 x 2 = 20 Marks
Part B : 5 x 14 = 70 Marks (Either or Pattern)
Part C: 1 x 10 = 10 Marks (Either or Pattern with no sub division) (Application/Design/Analysis/Evaluation/Creativity/Case Study)

Question Paper pattern for Engineering Graphics

Maximum Marks : 100
5x 20 = 100 Marks (Either or Pattern)

Question Paper pattern for Mathematics

Maximum Marks : 100
Part A : 10 x 2 = 20 Marks
Part B : 5 x 16 = 80 Marks (Either or Pattern)

b). **Laboratory Course:** The maximum marks for each laboratory / workshop practice course is 100. The performance of the student shall be continuously assessed throughout the semester for 50 marks and the remaining 50 marks for the ESE. The ESE is conducted for 100 marks and scored mark is reduced for 50. A student who secures not less than 50% of total marks prescribed for the course (CIA + ESE) with a minimum of 50% of the marks prescribed for the ESE shall be declared to have passed in the examination.

Mark distribution for End Semester Practical examination

Component	Experiment Preparation/ Program Structure	Process of the Experiment/ Program Coding & Execution	Result/ Output	Viva Voce	Total
Marks	20	50	15	15	100

c) Theory course with Laboratory component:

There is no ESE for laboratory component. In the ESE for theory component, a question paper is set for a maximum 100 marks. A student who secures not less than 50% of total marks prescribed for the course (CIA + ESE) with a minimum of 45% of the marks prescribed for the ESE of theory component shall be declared to have passed in the examination.

d). Mini Project Work: The Mini Project work shall be carried out in the V / VI semester of B.E. / B.Tech. programme and the evaluation will be done through presentation and viva - voce examination.

i. CIA - 50 marks

ii. ESE - 50 marks

In CIA, three reviews are conducted by the concerned project supervisor and the marks are awarded by the **supervisor** based on the performance.

Review I (out of 10Marks)	Review II (out of 20 Marks)	Review III (out of 20 Marks)	Total 50 Marks

In ESE, the report evaluation and viva - voce examination will be conducted by an Internal Committee constituted by the concerned HoD. The committee comprises of three faculty members of the department including the Supervisor but the assessment will be done by other two members.

ESE (50 Marks)	
Report Evaluation (30 Marks)	Viva – Voce (20 Marks)

e). Project work and viva – voce:

- The B.E. / B.Tech. Project work shall be carried out in the VII and VIII semester. Report evaluation and the viva - voce examination will be conducted at the respective ESE. Project work may be assigned to a single student or group of students not exceeding 4 in a group.
    i) CIA - 100 marks
    ii) ESE – Presentation / report and viva - voce examination- 100 marks
- There shall be three internal reviews during the semester by a review committee. The

student / students of the group shall make presentation on the progress made before the committee.

- The review committee is constituted by the concerned Head of the Department. There shall be a minimum of three members in the review committee including the project Supervisor. The student(s) will have to submit the project report on or before the date specified by the concerned HoD.
- The ESE for project work shall consist of evaluation of the final project report submitted by the student/students of the project group by an external examiner followed by a viva-voce examination conducted separately for each student by a committee consisting of the External examiner and an Internal examiner. The Principal / CoE of the college will appoint the External Examiners.
- If the project report is not submitted in time then the student(s) is deemed to have failed in the Project Work. The failed student(s) shall register for the same in the subsequent semester and repeat the project work.
- A student failing in project work and viva - voce examination for want of marks or due to absence shall register and appear as a supplementary student in the subsequent ESE.
- CIA and ESE marks for Project Work and the Viva-Voce Examination will be distributed as indicated below.

CIA - 100 Marks					
Review I (20 Marks)		**Review II** (40 Marks)		**Review III** (40 Marks)	
Review Committee (Excluding Supervisor)	Supervisor	Review Committee (Excluding Supervisor)	Supervisor	Review Committee (Excluding Supervisor)	Supervisor
10	10	25	15	25	15

ESE – 100 Marks **FOR ALL BE AND BTech PROGRAMMES**		
Report Evaluation (50 Marks)	Viva – Voce (50 Marks)	
External Examiner	External Examiner	Internal Examiner
50	25	25

Note: In all above cases, **the total marks obtained (CIA+ESE) shall be converted into corresponding grade point.**

f) Industrial Training/Internship/Technical seminar

1) **Industrial Training/Internship:** A student may undergo industrial training/internship for a period of not exceeding six weeks from third semester to sixth semester. On completion of the training, the student has to submit a report on the training / internship undergone and a certificate from the organization concerned. A three member Departmental Committee constituted by Head of the Department will evaluate the report, conduct viva voce examination and award appropriate grades and the credit points earned will depend on the duration of the industrial training/internship. Non submission of the industrial training report shall be considered as reappearance.

Credits distribution is in proportion with the duration of the training

Duration	Credit
2 weeks	1
4 weeks	2
6 weeks	3

2) **Technical Seminar:**

- a) A student can participate in National/International conference. If it is the case he/she has to provide the certificate and proceedings issued by the concerned authority.
  b) Also a student can give a seminar on Technical topics related to the course.

- In both cases, a three member Departmental Committee constituted by Head of the Department will evaluate the presentation, report and conduct viva voce examination and award marks appropriately.

As per the curriculum the credit point is awarded for the same

g). Online courses

As stated earlier in Clause 6.4, a student has a choice to study online courses. **Only one** such online is considered as equivalent to a **professional elective** with 3 credit weightage subject to the approval the Chairman, Academic Council.

If such a online course is opted by a student, the Department Academic Committee (DAC) shall have to analyze the quality of such online course and decide whether to recommend the online course to the Chairman, Academic council as equivalent to **professional elective course** having 3 credit weightage. If it is considered for recommendation, the student may be allowed to pursue that online course. On successful completion of an online course, the DAC can forward the same with the letter of recommendation duly signed by the HoD to the Chairman, Academic

council by enclosing the copies of the documents related to the online course. After scrutiny, the Chairman of Academic council may approve the same as equivalent to **one professional elective course**.

If it is approved by the Chairman, Academic Council, the student will be exempted from one professional elective course and 3 credits will be included for the calculation of CGPA.

The score/marks/grade obtained by the student in the online course will be converted into equivalent grade point by the OCoE.

A student may opt such online course in any one of the semesters from 5th semester to 7th semester.

Note: A student can do more than one online course only to earn extra credits.

h) Self- study courses

As stated earlier in Clause 6.5, a student can opt for self- study courses **but only one** such self study course is considered as equivalent to a **professional elective** with 3 credit weightage.

If such course is opted by a student, he/she will be monitored by the faculty coordinator of the department. The student is evaluated for 25 marks as per the CIA components mentioned in 15.1(ii), whereas attendance 5 marks is clubbed with assignment(i.e. Assignment 10 marks). He / She has to register that self study course for ESE along with the other courses of the semester.

A student who successfully completes a **Self Study course** may obtain exemption from studying one elective course and the credit points earned in the self study will be included for the calculation of CGPA. That is, the self-study course is considered as an equivalent to studying one elective course.

Note: A student can do more than one self study course only to earn extra credits.

i) Evaluation of Co-curricular and Extra-curricular activities:

For the Co-curricular and Extra - curricular activities like NSS/ NCC/ YRC/ CLUB ACTIVITIES/ GAMES and SPORTS/ FINE ARTS etc, a satisfactory/ not satisfactory remark will appear in the grade sheet depending on their involvement shown in the activities. A satisfactory remark in the above co-curricular activities is mandatory for the award of degree. However, the exemplary performers in the above activities will be awarded one / two credits under **earn extra credit** category subject to the recommendation of the concerned faculty coordinators and the approval of the Principal of the college.

17.0. PROVISION FOR WITHDRAWAL FROM EXAMINATION

i) A student may, for valid reasons be permitted to withdraw from appearing for the ESE in any course or courses in **ANY ONE** of the semester examinations during the entire duration of the degree programme. The application for the same shall be sent to Principal through HoD with required documents.

ii) Withdrawal application shall be valid only if the student is otherwise eligible to

write the examination and if it is made prior to the commencement of the examination in that course or courses and also recommended by the respective HoD and the Head of the Institution.

iii) Withdrawal shall not be construed as an appearance for the eligibility of a student for First Class with Distinction.

18.0. TEMPORARY BREAK OF STUDY FROM A PROGRAMME

1. A student is permitted to go on temporary break of study for a maximum period of one year, once in the entire duration of the programme. However, if a student intends to temporarily discontinue the programme in the middle for valid reasons (such as accident or hospitalization due to prolonged ill-health) and wishes to rejoin the programme in a later semester he / she shall apply to the Head of the Institution in advance as per the procedures and norms prescribed by the college authority.
2. The student permitted to rejoin the programme after the break shall be governed by the rules and regulations in force at the time of rejoining.
3. The duration specified for passing all the subjects for the purpose of classification shall be extended if such break of study is approved by competent authorities.
4. The total period for completion of the programme reckoned from the commencement of the first semester to which the student was admitted shall not exceed the maximum period specified irrespective of the period of break of study in order that he / she may be eligible for the award of degree.
5. If any student is detained for want of required attendance, progress or conduct, the period spent in that semester shall not be considered as permitted "Break of Study" is not applicable for this case.

19.0. FOR STUDENTS REJOINING THE PROGRAMME

A student who is required to repeat the study of any semester for want of attendance/ progress/conduct or who desires to rejoin the course after a period of discontinuance or who upon his/her own request is permitted by the authorities to repeat the study of any semester, may join the semester which he/she is eligible or permitted to join, only at the time of its normal commencement for a regular batch of students and after obtaining the approval from Directorate of Technical Education (DoTE) and Anna University, Chennai. No student will however be enrolled in more than one semester at any time.

In that case he/she has to come under the regulation which is being followed in that Academic year.

19.0. FOR TRANSFER STUDENTS

Students transferred from other Institutions may be admitted on obtaining the approval from DoTE and Anna University, Chennai. In that case he/she has to come under the regulation which is being followed in that Academic year and also should obtain equivalence from the Controller of Examinations.

21.0. PROVISION OF SCRIBE:

i) The Appointment of scribes for the students with disabilities shall be done by the Controller Office. In this connection the student shall submit her/his requisition through proper approval of HoD and Principal to CoE office well in advance prior to the examinations. (at least 15 days before the commencement of Examinations).

ii) However, students injured during the study holidays and in between the examination period and not able to write, on producing medical certificate from Civil Surgeon will be given Scribe.

22.0. AWARD OF LETTER GRADES

All assessments of a course shall be done on absolute marks basis. However, for the purpose of reporting the performance of a student, letter grades, each carrying certain points, will be awarded as per the range of total marks (out of 100) obtained by the student as detailed below.

Letter Grade	Grade point	Range of marks
O(Outstanding)	10	90 - 100
A + **(**Excellent)	9	80 - 89
A (Very Good)	8	70 - 79
B + (Good)	7	60 - 69
B (Above Average)	6	50 - 59
RA (Reappearance)	0	
Absent	0	
Withdrawal	0	
With Held	0	

RA – Reappearance
AB – Absent → FAIL
W - Withdrawal from appearing for the examination in the course concerned.
WH – Malpractice of any kind

After results are declared, grade sheets will be issued to each student.

23.0. CALCULATION OF GRADE POINT AVERAGE OF A SEMESTER (SGPA) AND CUMULATIVE GRADE POINT AVERAGE (CGPA)

SGPA is calculated as follows.

$$\textbf{SGPA} = \frac{\text{Sum of the product of the GP by the corresponding credits of the courses offered in that Semester}}{\text{Sum of the credits of the courses of that Semester}}$$

i.e. **SGPA** $= \dfrac{\sum_i CiGPi}{\sum_i Ci}$

In a similar way CGPA of a programme is calculated as follows,

$$\textbf{CGPA} \text{ of the entire programme} = \frac{\text{Sum of the product of the GPs by the corresponding credits of the courses offered for the entire programme}}{\text{Sum of the credits of the courses of the entire programme}}$$

i.e. **CGPA** of the entire programme $= \dfrac{\sum_n \sum_i CniGPni}{\sum_n \sum_i Cni}$

where,

Ci is the credit fixed for the course i in any semester

GPi is the grade point obtained for the course i in any semester

n refers to the Semester in which such courses are credited

Note: RA grade will be excluded for calculating **SGPA** and **CGPA**.

24.0. SPECIAL SUPPLEMENTARY EXAMINATIONS

After the publication of FINAL Semester ESE and the corresponding revaluation results if a student has **arrear in only one course** for the entire programme, he/she will be permitted to take up the supplementary examination within one month after the publication of the revaluation results.

25.0. CLASSIFICATION OF THE DEGREE AWARDED

25.1. First Class with Distinction:

A student who satisfies the following conditions shall be declared to have passed the examination in **First Class with Distinction**:

- Should have passed the examination in all the courses of all eight semesters in the student's First Appearance within **five** years, which includes authorized break of study of one year. If availed withdrawal from examination it 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 ESE due to lack of attendance in any of the courses.

25.2. First Class:

A student who satisfies the following conditions shall be declared to have passed the examination in **First Class:**

- Should have passed the examination in all the courses of all eight semesters within **five** years, which includes one year of authorized break of study (if availed) or prevention from writing the ESE due to lack of attendance (if applicable).
- Should have secured CGPA of not less than **6.50**

25.3. Second Class:

All other students, who qualify for the award of the degree shall be declared to have passed the examination in **Second Class.**

25.4. A student who is absent in ESE in a course /project work after having registered for the same shall be considered to have appeared in that examination except approved withdrawal from ESE for the purpose of classification.

26.0. REQUEST FOR PHOTO COPY OF THE VALUED ANSWER SCRIPT/ REVALUATION

A student can apply for viewing of valued answer script and / or revaluation of his / her semester examination answer paper in theory courses, within FIVE working days from the declaration of results, and on the dates specified by the Controller of Examinations on payment of a prescribed fee along with proper application to the Controller of Examinations. The Controller of Examinations shall arrange for viewing / revaluation and the revaluation result shall be published soon after the revaluation process is completed.

27.0. FACULTY ADVISOR

To help students in planning their courses of study, the Head of the Department / Senior Faculty Advisor will allot a certain number of students to a teacher of the department who shall function as Faculty Advisor for those students throughout their period of study. The faculty advisor will supervise the student during enrollment, registration of courses and authorize the final registration of the courses at the beginning of each semester and monitor their attendance and counsel them periodically. If necessary, the Faculty Advisor may also inform the parents about the progress of the students.

28.0. CLASS COMMITTEE

Every class shall have a class committee consisting of **faculty members of the class** concerned, **eight student representatives** (includes girls and students of various categories such as above average, average, slow learner etc) and a **chairperson who is not teaching the course** for the class. The class committee for a class is constituted by the Head of the department within the first week of each semester. However, the first semester is generally common to all branches; the class committee will be constituted by the HoD (S&H) / Principal. The overall goal of the class committee is to improve the teaching-learning process. The functions of the class committee include:

- Clarifying the regulations of the degree programme and the details of rules therein.
- Resolving difficulties experienced by students in the classroom and in the laboratories.
- Informing the student representatives the academic schedule including the dates of assessments (Tests & Assignments) and the syllabus coverage for each assessment.
- Evaluating the performance of the students of the class after each test and finding the ways and means of improvement.
- Identifying the slow learners, if any, and requesting the faculty handling the course to provide some additional help or guidance or coaching to such slow learners.
- The Principal may participate in any class committee meeting of the institution as and when required.
- The Chair person is required to prepare the minutes of the meeting, signed by the members and submit the same to HOD within two working days of the meeting. HOD will in turn forward the same to the Principal.
- 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 Principal.
- The **first meeting** of the class committee shall be held within two weeks from the date of commencement of the semester, in order to inform the students about the nature and allocate on of marks for CIA within the framework of the regulations.
- The **second meeting** a week after the first test results
- The class committee shall meet atleast three times in a semester
- The **third meeting** before the last internal test of the semester.

Student representatives of the class committee should collect information regarding the teaching learning process of the class from the fellow students of the class before attending the class committee meeting. Also, during these meetings they shall meaningfully interact and express the opinions and suggestions of the other students of the class to improve the effectiveness of the teaching-learning process.

29.0. COURSE COMMITTEE FOR COMMON COURSES

Each common theory course offered to more than one discipline/class, shall have a "Course Committee" comprising all the faculty 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. The 'Course committee' shall meet in order to arrive at a common scheme of teaching, portion coverage and evaluation for the test. Wherever feasible, the course committee may also prepare a common question paper for the internal assessment test(s).

30.0. INDUSTRIAL VISITS

Industrial visits shall be arranged for students to help them understand the academic - industry environments. This will help them prepare themselves to meet the requirements of industry when they go for employment or when they become entrepreneurs.

31.0. HUMAN VALUES, LIFE SKILLS AND PROFESSIONAL ETHICS

Human Values, Life skills and Professional Ethics are taught in the curriculum to train the students not only become competent engineers but also as responsible citizens of the country. Two credits are allotted for this subject and the grades obtained are considered for the classification of degree.

32.0. DISCIPLINE

Every student is required to observe discipline and maintain decorum both inside and outside the college and not indulge in any activity which lowers the prestige of the Institute.

33.0. MALPRACTICE

If a student indulges in malpractice in the ESE he / she shall be liable for punishment as prescribed in the book of **Examination Rules And Regulations.**

34.0. REVISION OF REGULATIONS AND CURRICULUM

The standing committee/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.

35.0. 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 interpretation/ 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 is final.

CURRICULUM & SYLLABUS

SEMESTER I

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
THEORY									
1	16MA1101	Engineering Mathematics-I	3	1	0	4	25	75	100
2	16PH1101	Engineering Physics	3	0	0	3	25	75	100
3	16CY1101	Engineering Chemistry	3	0	0	3	25	75	100
4	16HE1101R	Essential English for Engineers – I	3	1	0	4	50	50	100
5	16GE1101	Computer Programming	3	0	0	3	25	75	100
6	16EC1202	Basics of Electronics Engineering	3	1	0	4	25	75	100
PRACTICAL									
7	16PS1001	Physical Sciences Lab - I	0	0	2	1	50	50	100
8	16GE1001	Computer Programming Lab	0	0	4	2	50	50	100
9	16GE1002	Engineering Practices Lab	0	0	4	2	50	50	100
10	16GE1003	Value Added Course - I	0	0	2	1	0	100	100
Total Credits:			**18**	**3**	**12**	**27**			**900**

SEMESTER II

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
THEORY									
1	16MA2102	Engineering Mathematics-II	3	1	0	4	25	75	100
2	16PH2102	Physics of Materials	3	0	0	3	25	75	100
3	16CY2102	Environmental Sciences	3	0	0	3	25	75	100
4	16HE2102R	Essential English for Engineers - II	3	1	0	4	50	50	100
5	16GE2102	Engineering Graphics	2	0	4	4	25	75	100
6	16CS2201	Object Oriented Programming With C++	3	0	0	3	25	75	100
PRACTICAL									
7	16PS2001	Physical Sciences Lab - II	0	0	2	1	50	50	100
8	16CS2001	Object Oriented Programming Lab	0	0	4	2	50	50	100
9	16GE2001	Value Added Course - II	0	0	2	1	0	100	100
Total Credits:			**17**	**2**	**12**	**25**			**900**

SEMESTER III

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
THEORY									
1	16MA3105	Discrete Mathematics and Graph Theory	3	1	0	4	25	75	100
2	16CS3201	Digital Principles and System Design	3	0	2	4	25	75	100
3	16CS3202	Data Structures	3	0	0	3	25	75	100
4	16CS3203	Software Analysis and Design	3	0	0	3	25	75	100
5	16CS3204	Operating Systems	3	0	0	3	25	75	100
6	16CS3205	Professional Ethics	3	0	0	3	25	75	100
PRACTICAL									
7	16CS3001	Data Structures Laboratory	0	0	4	2	50	50	100
8	16CS3002	Operating Systems Laboratory	0	0	4	2	50	50	100
Total Credits:			**18**	**2**	**10**	**24**			**800**

SEMESTER IV

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
THEORY									
1	16MA4108	Probability and Queuing Theory	3	1	0	4	25	75	100
2	16CS4201	Java Programming	3	0	0	3	25	75	100
3	16CS4202	Microprocessors and Micro controllers	3	0	0	3	25	75	100
4	16CS4203	Database Management Systems	3	0	0	3	25	75	100
5	16CS4204	Computer Graphics	3	0	0	3	25	75	100
6	16CS4205	Fundamental of Algorithms	3	0	0	3	25	75	100
PRACTICAL									
7	16CS4001	Java Programming Laborary	0	0	4	2	50	50	100
8	16CS4002	Database Management and Systems Laboratory	0	0	4	2	50	50	100
9	16CS4003	Microprocessors and Micro controllers Laboratory	0	0	4	2	50	50	100
Total Credits:			**18**	**1**	**12**	**25**			**800**

SEMESTER V

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
THEORY									
1	16CS5201	Computer Networks	3	0	0	3	25	75	100
2	16CS5202	Free open source Software I	3	0	0	3	25	75	100
3	16CS5203	Computer Architecture	3	0	0	3	25	75	100
4	16CS5204	Theory of Computation	3	0	0	3	25	75	100
5	16CS53XX	**Professional Elective – I**	3	0	0	3	25	75	100
PRACTICAL									
6	16CS5001	Networks Laboratory	0	0	4	2	50	50	100
7	16CS5002	Open source programming Laboratory I	0	0	4	2	50	50	100
8	16CS5701	Technical Seminar	0	0	4	2	50	50	100
Total Credits			**15**	**1**	**12**	**22**			**800**

SEMESTER VI

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
THEORY									
1	16CS6201	Free open source Software II	3	0	0	3	25	75	100
2	16CS6202	Compiler Design	3	0	0	3	25	75	100
3	16CS6203	Internet of Things	3	0	0	3	25	75	100
4	16CS6204	Software Quality Assurance	3	0	0	3	25	75	100
5	**16CS63XX**	**Professional Elective – II**	3	0	0	3	25	75	100
6	**16XX64XX**	**Open Elective – I**	3	0	0	3	25	75	100
PRACTICAL									
7	16CS6001	Open source programming Laboratory II	0	0	4	2	50	50	100
8	16CS6002	Compiler Design Laboratory	0	0	4	2	50	50	100
9	16CS6801	Mini Project	0	0	6	3	50	50	100
Total Credits:			**18**	**0**	**14**	**25**			**900**

SEMESTER VII

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
THEORY									
1	16CS7201	Cryptography and Network Security	3	0	0	3	25	75	100
2	16CS7202	Distributed and Cloud Computing	3	0	0	3	25	75	100
3	16CS7203	**Mobile Computing**	3	0	0	3	25	75	100
4	**16CS73XX**	**Professional Elective – III**	3	0	0	3	25	75	100
5	**16CS73XX**	**Professional Elective – IV**	3	0	0	3	25	75	100
6	**16XX74XX**	**Open Elective – II**	3	0	0	3	25	75	100
PRACTICAL									
7	16CS7001	Cryptography and Network Security Laboratory	0	0	4	2	50	50	100
8	16CS7002	Cloud Computing Laboratory	0	0	4	2	50	50	100
Total Credits:			**18**	**0**	**8**	**22**			**800**

SEMESTER VIII

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
THEORY									
1	**16CS83XX**	**Professional Elective – V**	3	0	0	3	25	75	100
2	**16CS83XX**	**Professional Elective – VI**	3	0	0	3	25	75	100
PRACTICAL									
3	16CS8901	Project Work	0	0	24	12	100	100	200
Total Credits:			**6**	**0**	**24**	**18**			**400**

LIST OF PROFESSIONAL ELECTIVES

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
ELECTIVE I									
1	16CS5301	Advanced Java Programming	3	0	0	3	25	75	100
2	16CS5302	Visualization Techniques	3	0	0	3	25	75	100
3	16CS5303	Service Oriented Architecture	3	0	0	3	25	75	100
4	16CS5304	Information Storage Management	3	0	0	3	25	75	100
5	16CS5305	TCP/IP Principles and Architecture	3	0	0	3	25	75	100
6	16CS5306	System Software	3	0	0	3	25	75	100
ELECTIVE II									
1	16CS6301	Enterprise Computing	3	0	0	3	25	75	100
2	16CS6302	Social Network Analysis	3	0	0	3	25	75	100
3	16CS6303	Embedded Systems	3	0	0	3	25	75	100
4	16CS6304	Total Quality Management	3	0	0	3	25	75	100
5	16CS6305	Network and Routing Protocols	3	0	0	3	25	75	100
6	16CS6306	Signals and Systems	3	0	0	3	25	75	100
ELECTIVE III									
1	16CS7301	C# and .NET Programming	3	0	0	3	25	75	100
2	16CS7302	Biometrics	3	0	0	3	25	75	100
3	16CS7303	E-Commerce	3	0	0	3	25	75	100
4	16CS7304	Wireless Sensor Networks	3	0	0	3	25	75	100
5	16CS7305	Data Mining and Warehousing	3	0	0	3	25	75	100
6	16CS7306	Digital Signal Processing	3	0	0	3	25	75	100

ELECTIVE IV									
1	16CS7307	Text Mining	3	0	0	3	25	75	100
2	16CS7308	Soft Computing	3	0	0	3	25	75	100
3	16CS7309	Human Interface System Design	3	0	0	3	25	75	100
4	16CS7310	Artificial Intelligence	3	0	0	3	25	75	100
5	16CS7311	High speed Networks	3	0	0	3	25	75	100
6	16CS7312	Semantic Web	3	0	0	3	25	75	100
ELECTIVE V									
1	16CS8301	Software Project Management	3	0	0	3	25	75	100
2	16CS8302	Web Technology	3	0	0	3	25	75	100
3	16CS8303	Pervasive Computing	3	0	0	3	25	75	100
4	16CS8304	Database Security and Privacy	3	0	0	3	25	75	100
5	16CS8305	R Programming	3	0	0	3	25	75	100
6	16CS8306	Database Tuning	3	0	0	3	25	75	100
ELECTIVE VI									
1	16CS8307	Visual Programming	3	0	0	3	25	75	100
2	16CS8308	Software Testing	3	0	0	3	25	75	100
3	16CS8309	High Performance Computing	3	0	0	3	25	75	100
4	16CS8310	Management Information System	3	0	0	3	25	75	100
5	16CS8311	Engineering Economics	3	0	0	3	25	75	100
6	16CS8312	Big data Analytics	3	0	0	3	25	75	100

OPEN ELECTIVE									
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
1	16CS6401	Programming languages	3	0	0	3	25	75	100
2	16CS7402	Optimization Techniques	3	0	0	3	25	75	100

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	**26**	**25**	**24**	**25**	**21**	**25**	**22**	**18**	**187**

Signature and Name of Chairman, BOS

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16MA1101	ENGINEERING MATHEMATICS – I (COMMON TO ALL BRANCHES)	3	1	0	4

Course Objective

1. Develop the skill to use matrix algebra techniques that is needed by engineers for practical applications.
2. Find curvature, evolutes and envelopes using the concept of differentiation.
3. Solve ordinary differential equations of certain types using Wronskian technique.
4. Familiarize the functions of several variables which are needed in many branches of engineering.
5. Understand the concept of double and triple integrals.

Unit	Description	Instructional Hours
I	**MATRICES** Eigen values and Eigen vectors of a real matrix – Properties of Eigen values and Eigen vectors (without proof) – Cayley - Hamilton Theorem (excluding proof) – Orthogonal matrices – Diagonalization of matrices by orthogonal transformation–Reduction of a quadratic form to canonical form by orthogonal transformation.	12
II	**DIFFERENTIAL CALCULUS** Curvature in cartesian co-ordinates – Radius and Centre of curvature - Circle of curvature – Involutes and Evolutes(parabola, ellipse, cycloid, asteroid) – Envelopes - single parameter and two parameter family of curves.	12
III	**ORDINARY DIFFERENTIAL EQUATIONS** Second and higher order linear differential equations with constant coefficients and with RHS of the form e^{ax} , x^n, sinax or cosax , $e^{ax}f(x)$ and $xf(x)$ where $f(x)$ is sinbx or cosbx – Method of variation of parameters – Linear differential equations with variable coefficients (Euler's equation)	12
IV	**FUNCTIONS OF SEVERAL VARIABLES** Total differentiation (excluding implicit functions) - Partial derivatives of composite functions - Taylor's series for functions of two variables- Maxima and minima of functions of two variables - Lagrange's method of undetermined multipliers – Jacobians.	12
V	**MULTIPLE INTEGRALS** Double integrals in Cartesian coordinates – Change of order of integration – Area enclosed by the plane curves (excluding surface area) – Triple integrals in Cartesian co-ordinates – Volume of solids using Cartesian co-ordinates.	12
	TOTAL INSTRUCTIONAL HOURS	**60**

Course Outcome

CO1: Calculate Eigen values and Eigen vectors for a matrix which are used to determine the natural frequencies (or Eigen frequencies) of vibration and the shapes of these vibrational modes

CO2: Apply the concept of differentiation to find the radius, centre and circle of curvature of any curve

CO3: Develop sound knowledge of techniques in solving ordinary differential equations that model engineering problems

CO4: Identify the maximum and minimum values of surfaces.

CO5: Computation of area of a region in simpler way by changing the order of integration and evaluation of triple integrals to compute volume of three dimensional solid structures

TEXT BOOKS:

T1- Ravish R Singh, Mukul Bhatt, "Engineeing Mathematics", McGraw Hill education (India) Private Ltd.,Chennai,2017.

T2- Veerarajan T, "Engineering Mathematics–I", McGraw Hill Education(India) Pvt Ltd, New Delhi, 2016

REFERENCE BOOKS :

R1-Bali N.P & Manish Goyal, "A Text book of Engineering Mathematics", 8th Edition, Laxmi Pub. Pvt. Ltd. 2011.

R2- Grewal B.S, "Higher Engineering Mathematics", 42nd Edition, Khanna Publications, Delhi, 2012.

R3- Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage learning,2012.

R4-Sivarama Krishna Das P and Rukmangadachari E., "Engineering Mathematics" Vol I, Second Edition, Pearson publishing, 2011.

R5- Wylie & Barett, "Advanced Engineering Mathematics", McGraw Hill Education, 6th edition, 2003

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16PH1101	ENGINEERING PHYSICS (COMMON TO ALL BRANCHES)	3	0	0	3

Course Objective

1. Illustrate the fundamental knowledge in mechanical properties of matter and thermal physics.
2. Gain knowledge about laser and their applications.
3. Conversant with principles of optical fiber, types and applications of optical fiber.
4. Discuss the architectural acoustics and applications of Ultrasonics.
5. Extend dual nature of matter and the Necessity of quantum mechanics to explore the behavior of sub atomic particles.

Unit	Description	Instructional Hours
I	**PROPERTIES OF MATTER AND THERMAL PHYSICS** Elasticity – Hooke's law – Stress-strain diagram - Relation between three modulii of elasticity (qualitative) — Poisson's ratio – Bending moment – Depression of a cantilever – Derivation of Young's modulus of the material of the beam by Uniform bending – I-shaped girder. Modes of heat transfer – Thermal conductivity – Newton's law of cooling - Lee's disc method - Conduction through compound media (series and parallel).	9
II	**LASER AND APPLICATIONS** Spontaneous emission and stimulated emission – Population inversion – Pumping methods – Derivation of Einstein's coefficients (A&B) – Types of lasers – Nd:YAG laser, CO2 laser, Semiconductor lasers:(homojunction and heterojunction) – Laser Applications – Industrial applications: laser welding, laser cutting, laser drilling – Holography – Construction and reconstruction of images.	9
III	**FIBER OPTICS AND APPLICATIONS** Principle and propagation of light through optical fibers – Derivation of numerical aperture and acceptance angle – Classification of optical fibers (based on refractive index, modes and materials) – Crucible-crucible technique for fiber fabrication – Sources (LED and LASER) and detectors (p-i-n photodiode and avalanche photodiode) for fiber optics - Fiber optical communication link –Fiber optic sensors – Temperature and displacement sensors.	9
IV	**ACOUSTICS AND ULTRASONICS** Classification of sound – Weber–Fechner law – Sabine's formula (no derivation) - Absorption coefficient and its determination –Factors affecting acoustics of buildings and their remedies. Production – Magnetostrictive generator – Piezoelectric generator – Determination of velocity using acoustic grating – Non destructive testing – Ultrasonic pulse echo system.	9
V	**QUANTUM PHYSICS AND APPLICATIONS** Black body radiation – Planck's theory (derivation) –Compton effect experimental verification only - Matter waves – Physical significance of wave function – Schroedinger's wave equations – Time independent and time dependent wave equations –Particle in a box (One dimensional) – Scanning electron microscope – Transmission electron microscope.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Enhance the fundamental knowledge in Properties of Matter and Thermal Physics.
CO2: Uunderstand the advanced technology of LASER in the field of Engineering and medicine.
CO3: Exposed the fundamental knowledge of Optical fiber in the field of communication Engineering.
CO4: Understand the production of ultrasonics and its applications in NDT.
CO5: Impart the fundamental knowledge on Quantum Physics.

TEXT BOOKS:

T1 - Rajendran V, Applied Physics, Tata McGraw Hill Publishing Company Limited, New Delhi, 2011.
T2- Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, Dhanpat Rai Publications(P) Ltd., New Delhi, 2013.

REFERENCE BOOKS:

R1 - Arthur Beiser "Concepts of Modern Physics" Tata McGraw Hill, New Delhi – 2010
R2 - M.N Avadhanulu and PG Kshirsagar "A Text Book of Engineering physics" S. Chand and Company ltd., New Delhi, 2014
R3 - Dr. G. Senthilkumar "Engineering Physics – I" VRB publishers Pvt Ltd., 2013

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CY1101	ENGINEERING CHEMISTRY (COMMON TO ALL BRANCHES)	3	0	0	3

Course Objective

1. The student should be conversant with boiler feed water requirements, related problems and water treatment techniques.
2. The student should be conversant with the principles of polymer chemistry and engineering applications of polymers and composites
3. The student should be conversant with the principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.
4. To acquaint the student with important concepts of spectroscopy and its applications.
5. To acquaint the students with the basics of nano materials, their properties and applications

Unit	Description	Instructional Hours
I	**WATER TECHNOLOGY** Hard water and soft water- Disadvantages of hard water- Hardness: types of hardness, calculations, estimation of hardness of water – EDTA method - scales and sludges – boiler corrosion – priming and foaming – caustic embrittlement; Conditioning methods of hard water – External conditioning - demineralization process- Internal conditioning - domestic water treatment: screening, sedimentation, coagulation, filtration, disinfection – chlorine – UV method; desalination: definition, reverse osmosis.	9
II	**POLYMER & COMPOSITES** Polymerization – types of polymerization – addition and condensation polymerization – mechanism of free radical addition polymerization – copolymers – plastics: classification – thermoplastics and thermosetting plastics, preparation, properties and uses of commercial plastics – PVC, Teflon – moulding of plastics (extrusion and compression); rubber: vulcanization of rubber, synthetic rubber – butyl rubber, SBR; composites: definition, types of composites – polymer matrix composites – FRP.	9
III	**ENERGY SOURCES AND STORAGE DEVICES** Introduction- nuclear energy- nuclear fission- controlled nuclear fission- nuclear fusion differences between nuclear fission and fusion- nuclear chain reactions- nuclear reactor power generator- classification of nuclear reactor- light water reactor- breeder reactor- solar energy conversion- solar cells- wind energy. Batteries and fuel cells: Types of batteries- alkaline battery lead storage battery- nickel-cadmium battery- lithium battery- fuel cell H_2 -O_2 fuel cell applications.	9
IV	**ANALYTICAL TECHNIQUES** Beer-Lambert's law – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (block diagram only) – estimation of iron by colorimetry – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – interferences - estimation of nickel by atomic absorption spectroscopy.	9
V	**NANOMATERIALS** Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles: definition, carbon nanotubes (CNT), types of carbon nano tubes – single walled and multi walled carbon nanotubes – synthesis of carbon nanotubes: chemical vapour deposition – laser ablation – arc-discharge method; properties of CNT: mechanical, electrical, thermal and optical properties; applications of carbon nanotubes in chemical field, medicinal field, mechanical field and current applications.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome	CO1: Illustration of the basic parameters of water, different water softening processes and effect of hard water in industries. CO2: Knowledge on basic properties and application of various polymers and composites as an engineering material. CO3: Summarize the various energy sources and energy storage devices CO4: Analyze various analytical skills in handling various machines, instruments, apart from understanding the mechanism involved. CO5: Describe the basic properties and application of nano materials.

TEXT BOOKS

T1 - P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2015).
T2 - O.G.Palanna, "Engineering chemistry" McGraw Hill Education India (2017).

REFERENCES

R1 - B.Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).
R2 - B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2005).
R3 - S.S.Dara "A Text book of Engineering Chemistry" S.Chand & Co.Ltd., New Delhi (2010).

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16HE1101R	ESSENTIAL ENGLISH FOR ENGINEERS – I (COMMON TO ALL BRANCHES)	3	1	0	4

Course Objective

1. It fulfills the necessary skills needed in today's global workplaces.
2. Student will be able to interpret and illustrate formal communication.
3. It empowers students in choosing right lexical techniques for effective presentation
4. It equips the learner to analyze and list out things in logical order
5. The learner develops the ability to create and integrate ideas in a professional way.

Unit	Description	Instructional Hours
I	Getting to know people – Introduction – Talking about jobs (Present Simple) – Talking about working conditions(Adverb of Frequency) - Talking about company history and structure (Past simple, Prepositions of Time) – Talking about company activities (Connectors of addition and contrast, Present Continuous) – Focus on language – Parts of Speech – Gerund and Infinitives – Instruction-**General Vocabulary**.	12
II	Vocabulary practice – (Telephoning Leaving and taking messages) – requests and obligation – Describing trends (Adjectives and Adverbs) – Talking about company performance (present perfect and past simple, Reasons and consequences) – Reading Test Practice Describing products Dimensions, (Comparatives and Superlatives, Question formation) – Talking about product development (Sequencing words, Present continuous and going to) – Articles – Prepositions- Synonyms – Antonyms- Recommendations-**Interpretation of a chart**.	12
III	Talking about business equipment (Giving Instruction) – Letter Phrases- Writing Test Practice- Talking about facilities(Asking for and giving direction)- Presentation on a general topic -Talking about traffic and transport(making predictions)-**Discussion on current affairs**– Tenses- Present – Past-Future-Forms of verbs- Word techniques- Formation-Prefixes-Suffixes.	12
IV	Talking about conference arrangement(checking and confirming) – Talking about a conference before, after, when, until etc. – Listening Test Practice- talking about production process – passive- Talking about quality control Conditional 1 (real) (Making suggestions) – Itinery- Jumbled sentences- Paragraph writing- Essay writing – Checklist- Letter to Inviting Dignitaries – Accepting invitation- Declining Invitation.	12
V	Talking about call centers, insurance and changes in working practices (future possibility/probability)- Talking about banking- Speaking Test practice – Talking about delivery services (preposition of Time)- Talking about trading (Tense review)- Talking about recruitment conditional 2 (hypothetical) – talking about job applications (indirect questions) – Reading, Writing and Listening Test – Job application Letter and Resume Writing- Permission letters.	12
	TOTAL INSTRUCTIONAL HOURS	**60**

Course Outcome

CO1: Recognize different parts of speech for better usage.
CO2: Interpret and illustrate formal communication
CO3: Choosing right lexical techniques for effective presentation.
CO4: Analyze and list out things in logical order.
CO5: Create and integrate ideas in a professional way.

TEXT BOOKS:

T1 - Norman Whitby, Cambridge English: Business BENCHMARK Pre-intermediate to Intermediate – 2nd Edition. 2014.
T2 - Ian Wood and Anne Willams. "Pass Cambridge BEC Preliminary", Cengage Learning press 2013.

REFERENCE BOOKS :

R1 - Meenakshi Raman and Sangeetha Sharma. "Technical Communication-Principles and Practice", Oxford University Press, 2009.

R2 - Rizvi, Ashraf. M. Effective Technical Communication. Tata McGraw-Hill, New Delhi. 2005

R3 - Kamalesh Sadanan "A Foundation Course for the Speakers of Tamil-Part-I &II", Orient Blackswan, 2010.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16GE1101	COMPUTER PROGRAMMING (COMMON TO ALL BRANCHES)	3	0	0	3

Course Objective

1. Learn the fundamentals of computers.
2. Learn the basics of C programming
3. Learn the basics of Arrays and String
4. Learn the uses of functions and pointers.
5. Learn the basics of structures and unions.

UNIT	DESCRIPTION	TOTAL INSTRUCTIONAL HOURS
I	**BASICS OF COMPUTER** Generation and Classification of Computers- Basic Organization of a Computer –Input and Output Devices–Hardware and Software definitions- Categories of Software- Number System Conversion and problems. Need for logical analysis and thinking – Algorithm -Pseudo code – Flow Chart.	9
II	**BASICS OF 'C' PROGRAMMING** Fundamentals of ' C' programming – Structure of a 'C' program – compilation and linking processes – Constants, Variables – Data Types –Expressions using operators in 'C' – Managing Input and Output operations-Decision making-Branching and Looping-Case study	9
III	**ARRAYS AND STRINGS** Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String Library functions – String Arrays. Matrix operations-Addition-Subtraction-Multiplication-Transpose-Case study.	9
IV	**FUNCTIONS AND POINTERS** Function – definition – Declaration – Types of Function definition – call by value-call by reference- Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays-Case study.	9
V	**STRUCTURES AND UNIONS** Structure- data type – definition – declaration –Nesting of structure - Union – Storage classes, Pre-processor directives-Case study.	9
	TOTAL INSTRCTIONAL HOURS	**45**

Course Outcome

CO1:Use computers at user level, including operating systems, programming environments and differentiate between basic concepts of computer hardware and software.
CO2: Analyze problems, design and implementing algorithmic solutions.
CO3:Use data representation for the fundamental data types, read, understand and trace the execution of programs written in C language.
CO4: Write the C code using a modular approach and recursive concepts.
CO5: Explain the use of pointers, Structures and union.

TEXT BOOKS:

T1 - Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
T2 - Dr.N.Sengottaiyan and K.Ramya, "Fundamentals of Computer Programming",Cengage Learning (India) Pvt. Ltd.,2016.

REFERENCE BOOKS:

R1 - Yashavant P. Kanetkar. " Let Us C", BPB Publications, 2011.
R2- Balagurusamy"Programming in ANSI C", Schaum's Outlines, Second Edition, Tata McGraw-Hill, 2006.
R3 - M.Rajaram and P.Uma maheswari, "Computer Programming with C" Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2014.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16EC1202	BASICS OF ELECTRONICS ENGINEERING (CSE & IT)	3	1	0	4

Course Objective

1. To explain the basic electronic circuits and the different components.
2. To explain the fundamentals of semiconductor and applications.
3. To explain the fundamentals of power supply circuits.
4. To explain the principles of digital electronics.
5. To impart knowledge of communication engineering

Unit	Description	Instructional Hours
I	**ELECTRIC CIRCUIT ANALYSIS** Ohm's Law – Kirchoff's Laws – Series and Parallel circuits –Voltage and Current division techniques - Mesh current and Node voltage method for DC Circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase Circuits –R,RL,RC,RLC Circuits.	15
II	**SEMI CONDUCTOR DEVICES AND APPLICATIONS** Characteristics of PN Junction Diode – Zener Diode and its Characteristics – Zener Effect – Voltage Regulation. Bipolar Junction Transistor (BJT) – CB, CE, CC Configurations and Characteristics, UJT -Characteristics.	15
III	**POWER TRANSISTORS AND POWER SUPPLY CIRCUITS** Halfwave and Fullwave Rectifier - Filter Types - Capacitive Filter - Configurations and Characteristics of SCR – FET – MOSFET - Linear Mode & Switched Mode Power Supply (Block Diagram Approach only)	15
IV	**DIGITAL ELECTRONICS** Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops: RS, JK, T & D FF – A/D and D/A Conversion (Dual Slope, SAR, Binary-weighted and R-2R)	15
V	**FUNDAMENTALS OF COMMUNICATION ENGINEERING** Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations - Satellite and Optical Fiber communication (Block Diagram Approach only).	15
	TOTAL INSTRUCTIONAL HOURS	**60**

Course Outcome

CO1: Ability to identify the electronic components
CO2:Ability to explain the characteristics of electronic devices.
CO3:Ability to understand power transistors and design power supply circuits.
CO4:Understand the basic principles of digital electronics.
CO5:Understand the fundamentals of Communication Engineering.

TEXT BOOKS:

T1 - Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics and Computer Engineering", Tata McGraw Hill, Second Edition, 2006.
T2 - David A. Bell, "Electronic Devices and Circuits", Prentice Hall of India, 2004.

REFERENCE BOOKS :

R1 - Mehta V K, "Principles of Electronics", S.Chand& Company Ltd, 1994.
R2 - Donald A Neamen, "Electronic Circuit Analysis and Design", Tata McGraw Hill, 3rd Edition, 2003.
R3 - Floyd, "Electron Devices", Pearson Asia 5th Edition, 2001.
R4 - MSedha R.S., "Applied Electronics", S. Chand & Co., 2006.
R5 - Wayne Tomasi, "Electronic Communication Systems", Pearson Education, 3rd Edition,2001.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16PS1001	PHYSICAL SCIENCES LABORATORY – I (COMMON TO ALL BRANCHES)	0	0	2	1

Course Objective

1. Evaluate the particle size of micro particles and acceptance angle of fibres.
2. Employ instrumental method to determine Young's modulus of a beam of metals.
3. Apply the concept of diffraction and getting ability to calculate the wavelength of the mercury spectrum

Expt. No.	Description of the Experiments
1.	Determination of Wavelength, and particle size using Laser
2.	Determination of acceptance angle and numerical aperature in an optical fiber.
3.	Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
4.	Determination of wavelength of mercury spectrum – spectrometer grating
5.	Determination of thermal conductivity of a bad conductor – Lee's Disc method
6.	Determination of Young's modulus by Non uniform bending method
7.	Determination of specific resistance of a given coil of wire – Carey Foster's Bridge.
8.	Post office box Measurement of an unknown resistance
	TOTAL PRACTICAL HOURS 30

Course Outcome

CO1: Point out the particle size of micro particles and acceptance angle of fibres using diode laser.
CO2: Assess the Young's modulus of a beam using non uniform bending methods.
CO3: Illustrate the concept of diffraction and getting ability to calculate the wavelength of the mercury spectrum Using spectrometer.
CO4: Identify the velocity of ultrasonic's in the given liquid.
CO5: Illustrate phenomena of thermal conductivity of a bad conductor.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16GE1001	COMPUTER PROGRAMMING LAB (COMMON TO ALL BRANCHES)	0	0	4	2

Course Objective

1. Be familiar with Microsoft office software.
2. Be exposed to role of constants, variables, identifiers, operators and other building blocks of C Language.
3. Be familiar with the use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
4. Be familiar with the concept of Array and pointers dealing with memory management.
5. Be exposed to Structures and unions.

S.NO	DESCRIPTION PF THE EXPERIMENTS	TOTAL PRACTICAL HOURS
1.	**a. Word Processing:** 1. Document creation, Text manipulation with Scientific notations 2. Table creation, Table formatting and conversion 3. Mail merge and Letter preparation 4. Flow Chart	3
2.	**b. Spread Sheet:** 1. Chart - Line, XY, Bar and Pie. 2. Formula - formula editor. 3. Spread sheet - inclusion of object, picture and graphics, protecting the document and sheet. 4. Sorting and Import / Export features.	6
3.	**c. Basic C programming:** C program using I/O Statements	3
4.	C program using arithmetic operations	3
5.	Decision making statement & Looping Concepts • Designing a simple arithmetic calculator. (Use switch statement) • Performing the following operations: (Use loop statement) • Generate Pascal's triangle. • Construct a Pyramid of numbers.	6
6.	**d. Arrays and Strings** C program using one dimensional arrays	3
7.	C program using two dimensional arrays	3
8.	C program using string functions	3
9.	**e. Functions and pointers** Perform the following operations: (Use recursive functions) i. Find the factorial of a given integer. ii. Find the GCD (Greatest Common Divisor) of two given integers. iii. Solve Towers of Hanoi problem.	6
10.	Program to swap two numbers using pointers - call by reference.	3
11.	**f. Structures and Unions** C Program using Structures	3
12.	C Program using Unions	3
	TOTAL INSTRCTIONAL HOURS	**45**

Course Outcome	CO1: Use office packages for documentation and presentation. CO2: Implement program using control structures. CO3: Handle arrays and strings. CO4: Handle functions and pointers. CO5: Form heterogeneous data using structure and union.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16GE1002	ENGINEERING PRACTICES LABORATORY (COMMON TO ALL BRANCHES)	0	0	4	2

Course Objective To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)

S. NO	DESCRIPTION OF THE EXPERIMENTS	TOTAL PRACTICAL HOURS
	I CIVIL ENGINEERING PRACTICE	
	Study of plumbing and carpentry components of Residential and Industrial buildings.	
	(A) PLUMBING WORKS:	
1	Study on pipe joints, its location and functions: Valves, taps, couplings, unions, reducers, elbows in household fittings.	
2	Study of pipe connection requirements for pumps.	
3	Preparation of plumbing line sketches for water supply and sewage works.	
	Hands-on-exercise:	9
4	➢ Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.	
5	Demonstration of plumbing requirements of high-rise buildings.	
	(B) CARPENTRY USING POWER TOOLS ONLY:	
1	Study of the joints in roofs, doors, windows and furniture.	
2	Hands-on-exercise in wood works by sawing, planning and cutting.	
	II MECHANICAL ENGINEERING	
	(A) Welding:	
1	Preparation of arc welding of Butt joints, Lap joints and Tee joints	
	(B) Machining:	
1	Practice on Simple step turning and taper turning	
2	Practice on Drilling Practice	
	(C) Sheet Metal Work:	13
1	Practice on Models– Trays, cone and cylinder.	
	DEMONSTRATION	
	(D) Smithy	
	➢ Smithy operations: Upsetting, swaging, setting down and bending.	
	➢ Demonstration of – Production of hexagonal headed bolt.	
	(E) Gas welding	
	(F) Foundry Tools and operations.	

GROUP B (ELECTRICAL & ELECTRONICS)

S.NO	DESCRIPTION OF THE EXPERIMENTS	TOTAL PRACTICAL HOURS
ELECTRICAL ENGINEERING PRACTICES		
1	Residential house wiring using switches, fuse, indicator, lamp and energy meter.	10
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.	
ELECTRONICS ENGINEERING PRACTICES		
1	Study of Electronic components and equipments – Resistors - colour coding	13
2	Measurement of DC signal - AC signal parameters (peak-peak, RMS period, frequency) using CRO.	
3	Study of logic gates AND, OR, NOT and NAND .	
4	Soldering practice – Components Devices and Circuits – Using general purpose PCB.	
5	Measurement of average and RMS value of Half wave and Full Wave rectifiers.	
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

At the end of the course the students shall be able to

CO1: Fabricate wooden components and pipe connections including plumbing works.

CO2: Fabricate simple weld joints.

CO3: Fabricate electrical and electronics circuits.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E / B.Tech.	16GE1003	VALUE ADDED COURSE-I (COMMON TO ALL BRANCHES)	0	0	2	1

Topic No.	Description of the Experiments	
1.	INTRODUCTION TO AERONAUTICAL ENGINEERING	
2.	LEADERSHIP FOR ENGINEERS	
3.	4G – NETWORK ESSNTIALS	
4.	COMP. SCIENCE ESSENTIALS FOR SOFTWARE DEVELOPMENT	
5.	INTRODUCTION ANALYTICS MODELLING	
6.	MATERIAL SCIENCE AND ENGINEERING	
	Total Marks	100

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16 MA2102	ENGINEERING MATHEMATICS – II (COMMON TO ALL BRANCHES)	3	1	0	4

Course Objective

1. Learn the basics of vector calculus comprising gradient, divergence, Curl and line, surface, volume integrals.
2. Understand analytic functions of complex variables and conformal mappings.
3. Know the basics of residues, complex integration and contour integration.
4. Apply Laplace transform techniques to solve linear differential equations.
5. Know the effective mathematical tools for the solutions of partial differential equations that model several physical problems in mathematical physics

Unit	Description	Instructional Hours
I	**VECTOR CALCULUS** Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.	12
II	**ANALYTIC FUNCTIONS** Analytic function - Cauchy-Riemann equations - sufficient conditions (excluding proof) – Harmonic - conjugate harmonic functions– Construction of analytic functions (Milne-Thompson method) – Conformal mapping: w = z+c, cz, 1/z and bilinear transformation without problems related to the concept of conformal mapping.	12
III	**COMPLEX INTEGRATION** Complex integration – Statements of Cauchy's integral theorem – Taylor's and Laurent's series expansions - Singular points – Residues – Cauchy's residue theorem – Evaluation of real definite integrals as contour integrals around unit circle.	12
IV	**LAPLACE TRANSFORM** Laplace transform –Basic properties – Transforms of derivatives and integrals of functions - Transforms of unit step function and impulse function – Transform of periodic functions. Inverse Laplace transform - Convolution theorem (with out proof) – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.	12
V	**PARTIAL DIFFERENTIAL EQUATIONS** Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions-Solution of standard types of first order partial differential equations of the form f(p,q) = 0, Clairaut's type: z = px + qy + f(p, q) – Lagrange's linear equation- Linear homogeneous partial differential equations of second and higher order with constant coefficient.	12
	Total Instructional Hours	**60**

Course Outcome

CO1: Know the gradient, divergence and curl of vectors useful for engineering application like fluid flow, electricity and magnetism.
CO2: Test the analyticity to construct the analytic function and transform complex functions from one plane to another plane graphically.
CO3: Evaluate real and complex integrals over suitable closed paths or contours.
CO4: Know the applications of Laplace transform and its properties and to solve certain linear differential equations using Laplace transform technique.
CO5: Solve the engineering problems using Partial Differential Equations.

TEXT BOOKS:

T1- Ravish R Singh, Mukul Bhatt, "Engineeing Mathematics", McGraw Hill education (India) Private Ltd.,Chennai,2017.
T2- Veerarajan T, "Engineering Mathematics–II", McGraw Hill Education(India) Pvt Ltd, New Delhi, 2016

REFERENCE BOOKS :

R1-Bali N.P & Manish Goyal, "A Text book of Engineering Mathematics", 8th Edition, Laxmi Pub. Pvt. Ltd. 2011.
R2- Grewal B.S, "Higher Engineering Mathematics", 42nd Edition, Khanna Publications, Delhi, 2012.
R3- Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage learning,2012.
R4-Sivarama Krishna Das P and Rukmangadachari E., "Engineering Mathematics" Vol II, Second Edition, Pearson publishing, 2011.
R5- Wylie & Barett, "Advanced Engineering Mathematics", McGraw Hill Education, 6th edition, 2003

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16PH2102	PHYSICS OF MATERIALS (COMMON TO ALL BRANCHES)	3	0	0	3

Course Objective

1. Gain knowledge about conducting materials.
2. Provide fundamental knowledge of semiconducting materials which is related to the engineering program.
3. Extend the properties of magnetic materials, applications and super conducting materials.
4. Defend the various types of dielectric materials and their uses.
5. Expose the students to smart materials and the basis of nano technology.

Unit	Description	Instructional Hours
I	**CONDUCTING MATERIALS** Introduction – Conductors – Classical free electron theory of metals – Electrical and thermal conductivities – Wiedemann–Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi function – Density of energy states – Carrier concentration in metals.	9
II	**SEMICONDUCTING MATERIALS** Introduction – Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – compound semiconductors –direct and indirect band gap of semiconductors- derivation of carrier concentration in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration — Hall effect –Determination of Hall coefficient – Applications	9
III	**MAGNETIC & SUPERCONDUCTING MATERIALS** **Magnetic Materials**: Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti ferromagnetic materials – Ferrites and its applications. **Superconducting Materials :** Superconductivity : properties(Messiner effect, effect of magnetic field, effect of current and isotope effects) – Type I and Type II superconductors – BCS theory of superconductivity(Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.	9
IV	**DIELECTRIC & COMPOSITES MATERIALS** Introduction – Electrical susceptibility – dielectric constant – polarization - electronic, ionic, orientation and space charge polarization –internal field – Claussius – Mosotti relation (derivation) – dielectric loss and dielectric breakdown (qualitative) Introduction to composites materials – types of composites materials – polymer, metallic and ceramic matrix composites (qualitative). Application in surgery, sports equipment.	9
V	**SMART MATERIALS AND NANOTECHNOLOGY** **New Engineering Materials:** Metallic glasses – preparation, properties and applications – shape memory alloys (SMA) – characteristics, properties of NiTi alloy applications. **Nano Materials**: Synthesis - plasma arcing – Chemical vapour deposition – properties of nanoparicles and applications. – Carbon nano tubes – fabrication – pulsed laser deposition - Chemical vapour deposition - properties & applications.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Illustrate the electrical / thermal conductivity of conducting materials.
CO2: Understand the purpose of the acceptor or donor levels and the band gap of a semiconductor.
CO3: Interpret the basic idea behind the process of magnetism and applications of magnetic materials in every day life
CO4: Identify and compare the various types of dielectric polarization and dielectric breakdown.
CO5: Evaluate the properties and applications of various advanced engineering materials and develop the new ideas to synthesis Nano materials.

TEXT BOOKS:

T1 - S.O.Pillai "Solid State Physics" New Age International Publishers, New Delhi – 2011
T2- Rajendran V "Materials Science" McGraw-Hill Education" New Delhi -2016.

REFERENCE BOOKS:

R1 – William D Callister, Jr "Material Science and Engineering" John wiley and Sons, New York, 2014.
R2 - Raghavan, V. "Materials Science and Engineering – A First Course" Prentice Hall of India, New Delhi 2016.
R3 -Dr. G. Senthilkumar "Engineering Physics – II" VRB publishers Pvt Ltd., 2013

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CY2102	ENVIRONMENTAL SCIENCES (B.E., B.TECH., AERO, AUTO, CSE, ECE, EEE, EIE, IT, MECH, MECT)	3	0	0	3

Course Objective

1. To gain knowledge on the importance of environmental education, ecosystem and biodiversity.
2. To acquire knowledge about environmental pollution – sources, effects and control measures of environmental pollution.
3. To find and implement scientific, technological, economic and political solutions to environmental problems.
4. To study about the natural resources, exploitation and its conservation
5. To be aware of the national and international concern for environment and its protection.

Unit	Description	Instructional Hours
I	**ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY** Importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers- energy flow in the ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.	9
II	**ENVIRONMENTAL POLLUTION** Definition – causes, effects and control measures of: Air pollution – Air pollution standards – control methods- Water pollution – Water quality parameters- Soil pollution - Marine pollution - Noise pollution- Thermal pollution - Nuclear hazards–role of an individual in prevention of pollution – pollution case studies**.**	9
III	**NATURAL RESOURCES** Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and Desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.	9
IV	**SOCIAL ISSUES AND THE ENVIRONMENT** From unsustainable to sustainable development – urban problems related to energy- energy conversion – electrical energy calculations- environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- Current Environmental issues at Country level – management of municipal sewage, municipal solid waste, Hazardous waste and Bio-medical waste – Global issues – Climatic change, Acid rain, greenhouse effect and Ozone layer depletion. Disaster management: floods, earthquake, cyclone and landslides.	9

V	**HUMAN POPULATION AND THE ENVIRONMENT** Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA)- GIS-remote sensing-role of information technology in environment and human health – Case studies.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Understand the natural environment and its relationships with human activities.
CO2: Characterize and analyze human impacts on the environment
CO3: Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes
CO4: Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
CO5: Understand and implement scientific research strategies, including collection, management, evaluation, and interpretation of environmental data.

TEXT BOOKS:

T1- Anubha Kaushik and C. P. Kaushik, "Environmental Science and Engineering", Fourth edition, New Age International Publishers, New Delhi, 2014.
T2 – Deeksha Dave and S.S.Katewa, "Textbook of Environmental Studies", Second Edition, Cengage Learning, 2012.

REFERENCES:

R1 - Trivedi R.K. "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.
R2 - G.Tyler Miller, Jr and Scott E. Spoolman"Environmental Science" Thirteenth Edition, Cengage Learning, 2010.
R3 - Gilbert M. Masters, "Introduction to Environmental Engineering and Science", 2nd edition, Pearson Education, 2004

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16HE2102R	ESSENTIAL ENGLISH FOR ENGINEERS – II (COMMON TO ALL BRANCHES)	3	1	0	4

Course Objective

1. The learner will be introduced to global corporate culture and professional communication.
2. It helps the students to focus on organizing professional event and documentation.
3. The student will be able to describe the events and process in an effective way.
4. It trains the student to analyze the problems and to find solution to it.
5. The learner will be familiar with business communication.

Unit	Description	Instructional Hours
I	Introduction- talking about teamwork- Making arrangements- Improving Communication in spoken language – Taking and leaving Voice mail messages (present Tense, Past Tense and Present Perfect) Talking about Business Hotel- (Speaking Activity) Talking about Corporate Hospitality- Formal and Informal Language – Making accepting and declining invitations (Auxiliary Verb, Countable or Uncountable Nouns) – Focus on Language – Definitions and Extended Definitions-**Reading comprehension.**	12
II	Talking about orders – Clarity Written Language – Phone and Letter Phrases – Talking about Company Finances – Conditional 1 and 2 – Managing Cash Flow (Intention and Arrangements Conditional 1 and 2) – Talking about Brands and Marketing – Ethical Banking- Talking about Public Relations – Organizing a PR Event – Describing Duties and Responsibilities – (Future Tense and Articles) – Reported Speech – Modal Verbs and Passive, Impersonal Passive Voice-**interpretation of posters or advertisements.**	12
III	Talking about relocation – Report Phrases – Talking about Similarity and difference- Giving Directions- Asking for Information and Making Suggestions – Talking about Location (Comparatives and Superlatives, Participles) – Talking about Company Performances- Describing Trends – Describing Cause and Effect – Talking about Environmental Impact – Discussing Green Issues – Language of Presentations (Adjectives and Adverbs, Determiners)- Homophones – Homonyms- Acronyms-Abbreviations- British and American words.	12
IV	Talking about Health and Safety – Expressing Obligation- Discussing Regulations- Talking about personnel Problems – Passives – Talking about Problem at Work (modal Verbs, Passives)- Talking about Expenses Claims- Talking about Air Travel (Relative Pronoun, Indirect Questions) – **E-mail Writing - Note completion-** Transcoding.	12
V	Talking about staff Benefits- Talking about Appraisal Systems (gerunds and Infinitives, Reported Speech) – Talking about Marketing Disasters – Expressing hypothetical Situations- Talking about entering Foreign Market (Conditional 3, Grammar review) – Letter for calling quotations, Replying for quotations – Placing an order and Complaint and **reply to a complaint**.	12
	TOTAL INSTRUCTIONAL HOURS	**60**

Course Outcome

CO1: Introduced corporate culture and professional communication.
CO2: It focused on organizing a professional event and its documentation.
CO3: Improved the ability to describe the events and process in an effective way
CO4: Trained to analyze the problems and to find solution to it.
CO5: Practiced to make business communication.

TEXT BOOKS:

T1 - Norman Whitby, Cambridge English: Business BENCHMARK Pre-intermediate to Intermediate – 2nd Edition. 2014.
T2 - Ian Wood and Anne Willams. “Pass Cambridge BEC Preliminary”, Cengage Learning press 2013.

REFERENCE BOOKS :

R1 - Communication Skills for Engineers, Sunitha Misra & C.Murali Krishna, Pearson Publishers
R2 - Technical Communication, Daniel G. Riordan, Cengage learning publishers.
R3 - Kamalesh Sadanan "A Foundation Course for the Speakers of Tamil-Part-I &II", Orient Blackswan,2010.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16GE2102	ENGINEERING GRAPHICS (COMMON TO ALL BRANCHES)	2	0	4	4

Course Objective

1. To provide drafting skills for communicating the Engineering concepts and ideas.
2. To expose to BIS and International standards related to engineering drawings.

UNIT	DESCRIPTION	TOTAL HOURS
I	**PLANE CURVES** Importance of engineering drawing, drafting instruments, drawing sheets – layout and folding, Lettering and dimensioning, BIS standards and scales. Geometrical constructions, Construction of ellipse, parabola and Hyperbola by eccentricity method, construction of cycloids and involutes of square and circle – Drawing of tangents and normal to the above curves.	15
II	**PROJECTIONS OF POINTS, LINES AND PLANE SURFACES** Introduction to Orthographic projections- Projection of points. Projection of straight lines inclined to both the planes, Determination of true lengths and true inclinations by rotating line method. Projection of planes (polygonal and circular surfaces) inclined to both the planes by rotating object method (First angle projections only).	15
III	**PROJECTIONS OF SOLIDS** Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is perpendicular and inclined to one plane and objects inclined to both the planes by rotating object method.	15
IV	**SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES** Sectioning of simple solids with their axis in vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinder and cone. Development of lateral surfaces of truncated solids. Intersection of solids-cylinder vs cylinder.	15
V	**ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS** Isometric views and projections of simple and truncated solids such as - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions. Free hand sketching of multiple views from a pictorial drawing. Perspective projection of solids in simple position using visual ray method.	15
	TOTAL INSTRUCTIONAL HOURS	**75**

Course Outcome

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

CO1: Draw the orthographic and isometric views of regular solid objects including sectional views.

CO2: Recognize the International Standards in Engineering Drawing practices.

TEXT BOOKS:

T1. K.Venugopal, V.Prabu Raja, "Engineering Drawing, AutoCAD, Building Drawings", 5th Edition New Age International Publishers, New delhi 2016.

T2. K.V.Natarajan, "A textbook of Engineering Graphics", Dhanalaksmi Publishers, Chennai.

REFERENCE BOOKS:

R1. Basant Agrawal and C.M.Agrawal, "Engineering Drawing", Tata McGraw Hill Publishing Company Limited,New Delhi 2008.

R2. K. R. Gopalakrishnan, "Engineering Drawing" (Vol. I & II), Subhas Publications, Bangalore, 1998.

R3. M.B.Shah and B.C.Rana, "Engineering Drawing", Pearson Education, India, 2005.

R4. N.S. Parthasarathy, Vela Murali, "Engineering Drawing", Oxford University press, India 2015.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS2201	OBJECT ORIENTED PROGRAMMING WITH C++ (CSE & IT)	3	0	0	3

Course Objective

1. Be familiar with the C++ concepts of abstraction, encapsulation, constructor,
2. To understand the concepts of polymorphism, overloading and Inheritance
3. To learn the concept of file handling
4. To study the concept of generic programming
5. Learn to apply exception handling and use built classes from STL

Unit	Description	Instructional Hours
I	**INTRODUCTION TO OBJECT –ORIENTED PROGRAMMING** Object oriented programming concepts – objects – classes – methods and messages – abstraction and encapsulation – inheritance – abstract classes – polymorphism. Introduction to C++ – arrays – structures and unions- functions- Storage Class	9
II	**CONSTRUCTORS AND OPERATOR OVERLOADING** Defining a Class – creating objects - access specifiers – function and data members default arguments – function overloading – friend functions – const with class – static member of a class – nested classes – local classes - Constructors – destructors – operator overloading – overloading through friend functions – overloading the assignment operator – type conversion – explicit constructor	9
III	**TEMPLATES AND EXCEPTION HANDLING** Function and class templates - Exception handling – try-catch-throw paradigm – exception specification – terminate and Unexpected functions – Uncaught exception.	9
IV	**INHERITANCE AND POLYMORPHISM** Inheritance – public, private, and protected derivations – multiple inheritance – virtual base class – abstract class – composite objects Runtime polymorphism – virtual functions – pure virtual functions	9
V	**FILE HANDLING** File Streams and formatted I/O – I/O manipulators - file handling – File Pointes-random access – standard template library – STL Component	9
	TOTAL INSTRUCTIONAL HOURS	45

Course Outcome

CO1: Differentiate between structures oriented programming and object oriented programming.
CO2 : Design problem solutions using Object Oriented Techniques.
CO3: Apply the concepts of data abstraction, encapsulation and inheritance for problem solutions.
CO4: Apply concepts of operator overloading, constructors and destructors
CO5:Apply exception handling and use built -in classes from STL.

TEXT BOOKS:

T1. Robert Lafore, "Object-Oriented Programming in C++", Sams Publishing; 4 edition
T2. Rohit Khrana, "Object Oriented Programming with C++",Vikas Publishing, 2 edition

REFERENCE BOOKS:

R1. Ira Pohl, "Object Oriented Programming using C++", Pearson Education, Second Edition Reprint 2004
R2. S. B. Lippman, Josee Lajoie, Barbara E. Moo, "C++ Primer", Fourth Edition, Pearson Education, 2005.
R3. B. Stroustrup, "The C++ Programming language", Third edition, Pearson Education, 2004.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16PS2001	PHYSICAL SCIENCES LABORATORY – II (COMMON TO ALL BRANCHES)	0	0	2	1

Course Objective

1. Evaluate the band gap of a semiconductor.
2. Apply the concept of interference and calculate the thickness of thin wire.
3. Acquire the practical skills in Young's modulus by uniform bending method.

Expt. No.	Description of the Experiments
1.	Determination of Young's modulus by uniform bending method
2.	Determination of band gap of a semiconductor
3.	Determination of Coefficient of viscosity of a liquid –Poiseuille's method
4.	Determination of Dispersive power of a prism – Spectrometer
5.	Determination of thickness of a thin wire – Air wedge method
6.	Determination of Rigidity modulus – Torsion pendulum
7.	Magnetic hysteresis experiment
8.	Calibration of ammeter using potentiometer

TOTAL PRACTICAL HOURS 30

Course Outcome

CO1: Experiment involving the physical phenomena of the Rigidity modulus of wire.
CO2: Determine the band gap of a semiconductor and variation of Energy Gap (E_g) with temperature.
CO3: Assess the Young's modulus of a beam using non uniform bending method.
CO4: Explain the concept of interference and calculate the thickness of thin wire and other fine objects.
CO5: Experiment provides a unique opportunity to validate Dispersive power of a prism using Spectrometer.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS2011	OBJECT ORIENTED PROGRAMMING LAB (CSE & IT)	0	0	4	2

Course Objective

1. Understand the basic concepts of object oriented Programming
2. Understand concepts of class and objects in C++
3. Design the software using Inheritance and exception handling.

Expt. No.	Description of the Experiments
1.	Functions with default arguments, call by value, address, reference
2.	Primitive data members and arrays as data members in class
3.	Pointers as data members, constant data members and static member functions in class
4.	Constructors & destructors, copy constructor.
5.	Dynamic memory allocation methods
6.	Friend function & friend class.
7.	Inheritance.
8.	Polymorphism & function overloading.
9.	Virtual functions & dynamic polymorphism and RTTI
10.	Overload unary & binary operators both as member function & non member function
11.	Class templates & function templates.
12.	Exception Handling Mechanism
13.	Standard Template Library concept
14.	File Stream classes
	TOTAL PRACTICAL HOURS **45**

Course Outcome

CO1: Learn to write, compiling & execute basic C++ program.
CO2: Able to create classes and objects and use them in their program
CO3: Able to design software using inheritance concept.\
CO4: Able to identify the exception in program and handle them .
CO5::Able to model and implement software solutions with object oriented design concepts

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16GE2001	VALUE ADDED COURSE-II (COMMON TO ALL BRANCHES)	0	0	2	1

Topic No.	Description of the Experiments	
1.	A HANDS ON INTRODUCTION TO ENG.SIMULATIONS	
2.	INTRODUCTION STEEL	
3.	ENTERPRENUER DEVELOPMENT	
4.	DRINKING WATER TREATMENT	
5.	MECHANICAL BEHAVIOUR OF MATERIALS (LINEAR ELASTIC	
6.	FASCINATING WORLD OF ROBOTS AND ROBOTICS	
	Total Marks	100

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16MA3105	DISCRETE MATHEMATICS AND GRAPH THEORY	3	1	0	4

Course Objective

1. Introduce logical theory and predicate calculus techniques that will create logical thinking.
2. Generalize counting problems using mathematical induction, permutation and combinations.
3. Study the Boolean algebra which is used in the Boolean logics and circuits.
4. Understand computer concepts through algebraic structures
5. Create the basic knowledge of graph theory which are applied in Computer networks.

Unit	Description	Instructional Hours
I	**LOGIC AND PROOFS** Propositional logic - Tautology and Contradiction - Propositional equivalences - Normal forms - Principal normal forms - Theory of Inference - Predicate logic - Quantifiers - Theory of inference for predicate calculus.	12
II	**COMBINATORICS** Mathematical induction – The basics of counting – Permutation and combination – Recurrence relations – Solving linear recurrence relations - generating functions – principle of inclusion and exclusion – applications.	12
III	**LATTICS AND BOOLEAN ALGEBRA** Partial ordering – Posets – Lattices as posets – Properties of lattices – Lattices as algebraic system – Sub lattices - some special lattices – Boolean algebra.	12
IV	**ALGEBRAIC STRUCTURES** Algebraic systems – Semi group and monoids – Groups – Subgroups – Homomorphism – Normal subgroup and cosets – Lagrange's theorem – Definitions and examples of Rings and Fields.	12
V	**GRAPHS** Introduction – Graphs and graph models – graph terminology and special types of graphs – representing graphs and graph isomorphism – connectivity – Euler and Hamiltonian paths.	12
	Total Instructional Hours	**60**

Course Outcome

CO1: Understand the notion of mathematical thinking, mathematical proofs, and algorithmic thinking and be able to apply them in problem solving.
CO2: Ability to solve problems using counting techniques and combinations
CO3: Gain knowledge about Lattices and Boolean Algebra.
CO4: Able to use effectively algebraic techniques to analyze basic discrete structures and algorithms
CO5: Apply the properties of graphs and related discrete structures in computer networks.

TEXT BOOKS:

T1 - Ralph. P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", Fourth Edition, Pearson Education Asia, Delhi, 2007.
T2 - T.Veerarajan, "Discrete Mathematics with Graph Theory", ata. McGraw-Hill Education, fifth reprint,2008

REFERENCE BOOKS :

R1 – Jean Paul Trembley ,R Manohar,"Discrete Mathematical Structures with Application to Computer Science", McGraw Hill,Inc. New York, 30th reprint, 2011.
R2 - Kenneth H.Rosen, "Discrete Mathematics and its Applications", seventh Edition,Tata McGraw Hill Pub. Co. Ltd., New Delhi, 2011
R3 – Thomas Koshy., "Discrete Mathematics with Applications",Elsevier Publications,2006.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS3201	DIGITAL PRINCIPLES AND SYSTEM DESIGN (CSE & IT)	3	0	2	4

Course Objective

1. To understand different methods used for the simplification of Boolean functions.
2. To study combinational circuits.
3. To learn synchronous sequential circuits.
4. To understand asynchronous sequential circuits.
5. To study the fundamentals of HDL.

Unit	Description	Instructional Hours
I	**BOOLEAN ALGEBRA AND LOGIC GATES** Boolean algebra and laws-De-Morgan's Theorem-Principle of Duality-Minimization of Boolean expressions – Minterm – Maxterm – Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions-Tabulation method- Implementation of Boolean functions using logic gates.	10
II	**COMBINATIONAL CIRCUITS** Analysis and design of combinational circuits- Circuits for arithmetic operations: adder, subtractor, Serial adder/ Subtractor - Parallel adder/ Subtractor-Carry look ahead adder-BCD adder-Magnitude comparator-Encoders and Decoders-Multiplexers and Demultiplexers, Code converters-Memory and Programmable logic.	10
III	**SYNCHRONOUS SEQUENTIAL CIRCUITS** Flip flops - Design of synchronous sequential circuits: State diagram - State table – State minimization - State assignment. Shift registers-Counters.	9
IV	**ASYNCHRONOUS SEQUENTIAL CIRCUITS** Analysis and design of asynchronous sequential circuits - Reduction of state and flow tables – Race-free state assignment – Hazards.	9
V	**HARDWARE DESCRIPTION LANGUAGE** Introduction to Hardware Description Language (HDL)- HDL for combinational circuits- Half adder, Full adder, Multiplexer, De-multiplexer, HDL for Sequential Circuits- Flip flops, Synchronous and Asynchronous Counters, Registers.	7
	Total Instructional Hours	**45**

DIGITAL LABORATORY: LIST OF EXPERIMENTS

1. Verification of Boolean theorems using digital logic gates.
2. Design and implementation of Half/Full Adder & Half/Full Subtractor.
3. Design and implementation of Binary to Gray and Gray to Binary Conversion.
4. Design and implementation of Parity generator/checker.
5. Design and implementation of Multiplexers and Demultiplexers.
6. Design and implementation of Synchronous and Asynchronous Counters.
7. Coding Combinational/Sequential circuits using HDL.

Total Instructional Hours	**15**
Total(45+15)	**60**

Course Outcome	CO1: Simplify boolean functions using different methods. CO2: Design and implement combinational logic circuits. CO3: Design and implement various sequential logic circuits. CO4: Design using PLD. CO5: Write HDL code for digital circuits.

TEXT BOOKS:

T1 - Morris Mano M. and Michael D. Ciletti, "Digital Design", IV Edition, Pearson Education, 2008.
T2 - Charles H.Roth,Jr.,Lizy Kurian John, and Byeong Kil Lee,"Digital Systems Design using Verilog" First Edition,Cengage Learning, 2014.

REFERENCE BOOKS :

R1-.S. Salivahanan and S. Arivazhagan, "Digital Circuits and Design",SecondEdition, Vikas Publishing House Pvt. Ltd, New Delhi, 2010.
R2-.Thomas L. Floyd, "Digital Fundamentals", Pearson Education, Inc, New Delhi, 2013
R3-.Donald D.Givone, "Digital Principles and Design", Tata Mc-Graw-Hill Publishing company limited, New Delhi, 2013.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS3202	DATA STRUCTURES (CSE & IT)	3	0	0	3

Course Objective

1. To study the design and applications of ADTs and Linked List
2. To understand the various non-linear data structures like binary tree, binary search tree, AVL, and Binary Heap Tree
3. To build an application using sorting and searching
4. To understand the graph ADT and its applications
5. To understand various hashing techniques.

Unit	Description	Instructional Hours
I	**LINEAR STRUCTURES** Abstract Data Types (ADT) – List ADT – array-based implementation – linked list implementation – cursor-based linked lists – doubly-linked lists – applications of lists	9
II	**STACK AND QUEUES** Stack ADT – Queue ADT – circular queue implementation – Applications of stacks and queues.	7
III	**NON LINEAR DATA STRUCTURES-TREE** Tree ADT –Representation of trees–Binary Tree ADT – expression trees – applications of trees – BST ADT – tree traversals. AVL Trees –B-Tree – heaps – binary heaps – applications of binary heaps-Binomial heaps.	10
IV	**NON LINEAR DATA STRUCTURES-GRAPHS** Introduction to Graphs- Definitions – Breadth First Search -Depth First Search- Topological sort – Shortest-Path Algorithms – Dijkstra algorithm- MST- Prim's and Kruskal's algorithms – Floyd algorithm- Warshall's Algorithm - Biconnectivity – Euler circuits – applications of graphs.	10
V	**SORTING, SEARCHING** Sorting algorithms: Insertion sort -Selection sort -Shell sort -Bubble sort -Quick sort - Merge sort -Radix sort –Searching: Linear search –Binary Search - Hashing – Separate chaining – open addressing – rehashing – extendible hashing	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Implement the linear data structures
CO2: Understand the implementation of Stack and Queue
CO3: Formulate the different non-linear data structures like binary trees
CO4: Design algorithms for various searching and sorting techniques
CO5: Work with various Graph algorithms

TEXT BOOKS:

T1 - Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Third Edition, Addison-Wesley, 2007.
T2 - A. V. Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms", Pearson Education, 2009.

REFERENCE BOOKS :

R1 - Goodrich, Michael T., Roberto Tamassia, David Mount, "Data Structures and Algorithms in C++", 7th Edition, Wiley. 2004.
R2 - Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, "Fundamentals of Data Structures in C++", Galgotia Publications , 2007.
R3 - Y. Langsam, M. J. Augenstein and A. M. Tenenbaum, "Data Structures using C and C++", 2nd ed, Prentice-Hall of India, 2009.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS3203	SOFTWARE ANALYSIS AND DESIGN	3	0	0	3

Course Objective

1. To understand the basic concepts of software engineering, life cycle models and project management concepts.
2. To understand in detail about the requirement analysis and requirement engineering processes.
3. Learn the basics of OO analysis and design skills.
4. Learn the UML design diagrams.
5. Learn to map design to code.

Unit	Description	Instructional Hours
I	**SOFTWARE PROCESS AND PROJECT MANAGEMENT** Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models – Software Project Management: Estimation – LOC and FP Based Estimation, COCOMO Model – Project Scheduling – Scheduling, Earned Value Analysis - Risk Management.	9
II	**REQUIREMENTS ANALYSIS AND SPECIFICATION** Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management-Classical analysis: Structured system Analysis, Petri Nets-Data Dictionary.	9
III	**UML DIAGRAMS** Introduction to OOAD – Unified Process – UML diagrams – Use Case – Class Diagrams– Interaction Diagrams – State Diagrams – Activity Diagrams – Package, component and Deployment Diagrams	9
IV	**DESIGN PATTERNS** GRASP: Designing objects with responsibilities – Creator – Information expert – Low Coupling – High Cohesion – Controller – Design Patterns – creational – factory method – structural – Bridge – Adapter – behavioral – Strategy – observer.	9
V	**CASE STUDY** Case study – the Next Gen POS system, Inception -Use case Modeling – Relating Use cases – include, extend and generalization – Elaboration – Domain Models – Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class Hierarchies – Aggregation and Composition.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Identify the key activities in managing a software project
CO2: Compare different process models
CO3: Design and implement projects using OO concepts.
CO4: Use the UML analysis and design diagrams.
CO5: Apply appropriate design patterns.

TEXT BOOKS:

T1 - Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Seventh Edition,Mc Graw-Hill International Edition, 2010.
T2 - Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Third Edition, Pearson Education, 2005.

REFERENCE BOOKS :

R1 - Ian Sommerville, "Software Engineering", 9th Edition, Pearson Education Asia, 2011.
R2 - Simon Bennett, Steve Mc Robb and Ray Farmer, "Object Oriented Systems Analysis and Design Using UML", Fourth Edition, Mc-Graw Hill Education, 2010.
R3 - Erich Gamma, and Richard Helm, Ralph Johnson, John Vlissides, "Design Patterns: Elements Patterns: Elements of Reusable Object – Oriented Software", Addison-Wesley, 1995.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS3204	OPERATING SYSTEMS (CSE & IT)	3	0	0	3

Course Objective

1. Study the basic concepts and Understand the structure of operating systems
2. Learn about Processes, Scheduling algorithms and Deadlocks.
3. Learn various memory management schemes.
4. Study I/O management and File systems.
5. Learn the Distributed operating systems

Unit	Description	Instructional hours
I	**OPERATING SYSTEMS OVERVIEW** Introduction –operating systems overview- Evolution of Operating System.- Computer System Organization-Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot.	7
II	**PROCESS MANAGEMENT** Processes-Process Concept, Process Scheduling, Interprocess Communication; Threads-Overview, Multicore Programming, Multithreading Models. Process Synchronization - Critical Section Problem, Mutex Locks, Semaphores, Monitors; CPU Scheduling and Deadlocks	11
III	**STORAGE MANAGEMENT** Main Memory-Contiguous Memory Allocation, Segmentation, Paging, Virtual Memory-Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory	9
IV	**FILE SYSTEM IMPLEMENTATION & MASS STORAGE STRUCTURE** Mass Storage Structure- Overview, Disk Scheduling and Management; File System Storage-File Concepts, Directory and Disk Structure, Sharing and Protection; File System Implementation- File System Structure, Directory Structure, Allocation Methods, Free Space Management- I/O Systems	9
V	**TYPES OF OPERATING SYSTEMS** Single processor systems – Multiprocessor Systems – Clustered Systems – Real Time Systems – Open source operating system- Distributed Systems –Distributed operating systems – Distributed file systems –Distributed Synchronization. Case study: Linux Systems-Virtualization	9
	Total Instructional Hours	45

Course Outcome

CO1: Design various Scheduling algorithms.
CO2: Design deadlock, prevention and avoidance algorithms.
CO3: Compare and contrast various memory management schemes.
CO4: Design and Implement a prototype file systems.
CO5: Study the distributed operating systems

TEXT BOOK:

T1:Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9thEdition, John Wiley and Sons Inc., 2012.

T2: Tom Adelstein, Bill Lubanovic , "Linux System Administration Solve Real-life Linux Problems Quickly", O'Reilly Media.

REFERENCES:

R1: Andrew S. Tanenbaum, "Modern Operating Systems", 4/E, Pearson Publications, 2014.

R2: Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education", 1996.

R3: D M Dhamdhere, "Operating Systems: A Concept-Based Approach", Second Edition, TataMcGraw-Hill Education, 2007.

R4: Harvey M.Deitel-Operating systems,Third Edition,Pearson/Prentice Hall,2004.

R5:William Stallings, "Operating Systems –Internals and Design Principles", 8/E, Pearson Publications, 2014

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS3205	PROFESSIONAL ETHICS	3	0	0	3

Course Objective

1. To understand the importance of engineering ethics in an organizational setting.
2. To learn the various ethics and human values in workplace.
3. To understand the features of moral reasoning, moral explanations and the role of moral theories.
4. Understand the features of moral reasoning, moral explanations and the role of moral theories
5. Develop a case resolution model for resolving moral dilemmas faced by professionals

Unit	Description	Instructional Hours
I	**HUMAN VALUES** Morals, Values and Ethics –Integrity –Work Ethic –Service Learning –Civic Virtue –Respect for Others –Living Peacefully –caring –Sharing –Honesty –Courage –Valuing Time –Co-operation –Commitment –Empathy –Self-Confidence –Character –Spirituality	9
II	**ENGINEERING ETHICS** 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.	9
III	**ENGINEERING AS SOCIAL EXPERIMENTATION** Engineering as experimentation -engineers as responsible experimenters -codes of ethics –a balanced outlook on law -the challenger case study	9
IV	**SAFETY, RESPONSIBILITIES AND RIGHTS** 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.	9
V	**GLOBAL ISSUES** 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	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Analyze professional ethics and responsibilities.
CO2: Practice professional responsibilities and rights.
CO3: Solve moral dilemmas faced by professionals using ethical values.
CO4: Be familiar with types of ethical issues arising in the computing profession.
CO5: Develop a professional ethical identity to carry forward in their working life

TEXT BOOKS:

T1 - Mike Martin and Roland Schinzinger, ―Ethics in Engineering‖, McGraw - Hill, New York, 2005
T2 - Govindarajan M, Natarajan S, Senthil Kumar V. S, ―Engineering Ethics‖, Prentice Hall of India, New Delhi, 2004.

REFERENCE BOOKS :

R1 - Charles D. Fleddermann, ―Engineering Ethics‖, Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint).
R2 - 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).
R3 - John R Boatright, ―Ethics and the Conduct of Business‖, Pearson Education, New Delhi, 2003.
R4 - Edmund G Seebauer and Robert L Barry, ―Fundamentals of Ethics for Scientists and Engineers‖, Oxford University Press, Oxford, 2001.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS3001	DATA STRUCTURES LABORATORY (CSE & IT)	0	0	4	2

Course Objective

1. To learn the methodical way of solving problem
2. To comprehend the different methods of organizing large amount of data
3. To efficiently implement the different data structures.

Expt. No.	DESCRIPTION OF THE EXPERIMENTS
1.	Write a C++ program that uses functions to perform the following: a) Create a singly linked list of integers. b) Delete a given integer from the above linked list. c) Display the contents of the above list after deletion.
2.	Write a C++ program that uses functions to perform the following: a) Create a doubly linked list of integers. b) Delete a given integer from the above doubly linked list. c). Display the contents of the above list after deletion.
3.	Write a C++ program that uses stack operations to convert a given infix expression into its postfix Equivalent, Implement the stack using an array.
4.	Write C++ programs to implement a double ended queue ADT using i) array and ii) doubly linked list respectively..
5.	Write a C++ program that uses functions to perform the following: a) Create a binary search tree of characters. Traverse the above Binary search tree recursively in Postorder.
6.	Write a C++ program that uses functions to perform the following: a) Create a binary search tree of integers. Traverse the above Binary search tree non recursively in inorder.
7.	Write C++ programs for implementing the following sorting methods to arrange a list of integers in ascending order: a) Insertion sort b) Merge sort b)
8.	Write C++ programs for implementing the following sorting methods to arrange a list of integers in ascending order: a) Quick sort b) Selection sort
9.	Write C++ programs to perform the following searching i. Linear search ii) Binary Search ii.
10	i) write a C++ program to perform the following operation: A) Insertion into a B-tree ii) Write a C program for implementing Heap sort algorithm for sorting a given list of integers in ascending order
11	Write a C++ program to implement all the functions of a dictionary (ADT) using hashing.
12	Write C++ programs for implementing the following graph traversal algorithms: a)Depth first traversal b)Breadth first traversal

TOTAL PRACTICAL HOURS **45**

Course Outcome	CO1 - Abstract data and entities from the problem domain, build object models and design software solutions using object-oriented principles and strategies. CO2 - Break a problem into logical pieces and develop algorithms for solving simple problems. CO3 - Discover, explore and apply tools and best practices in object-oriented programming.

REFERENCE:

R1 - R. Gilberg, B. Forouzan, "Data Structures: A pseudo Code Approach with C++", Cengage Learning, ISBN 9788131503140. 2. E. Horowitz, S. Sahni, D. Mehta, "Fundamentals of Data Structures in C++", Galgotia Book Source, New Delhi, 1995, ISBN 16782928.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE

- Turbo C++ Compiler
- Operating System (Windows, UNIX, Linux...)

HARDWARE

Standalone desktops 30 Nos

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS3002	OPERATING SYSTEMS LAB (CSE & IT)	0	0	4	2

Course Objective

1. Learn shell programming and the use of filters in the UNIX environment.
2. Be familiar with implementation of CPU Scheduling Algorithms and file allocation strategies.
3. Gain knowledge in page replacement algorithms.
4. Acquire the knowledge about Deadlock detection and avoidance algorithms.
5. Learn to use the paging techniques in memory management.

Expt. No.	Description of the Experiments
1	Basics of UNIX commands.
2	Shell Programming.
3	Implement the following CPU scheduling algorithms a. Round Robin b. SJF c. FCFS d. Priority
4	Implement all file allocation strategies a. Sequential b. Indexed c. Linked
5	Implement Semaphores
6	Implement all File Organization Techniques a. Single level directory b. Two level c. Hierarchical d. DAG
7	Implement Bankers Algorithm for Dead Lock Avoidance
8	Implement an Algorithm for Dead Lock Detection
9	Implement e all page replacement algorithms a. FIFO b. LRU c. LFU
10	Simulate Paging Technique of memory management.
11	Experiments on fork
12	Implement Paging Technique of memory management.

TOTAL INSTRUCTIONAL HOURS 45

Course Outcome

CO1: Apply the basic Unix commands and shell concepts in real time.
CO2: Compare the performance of various CPU Scheduling Algorithms and file allocation strategies.
CO3: Analyze the performance of the various page replacement algorithms
CO4: Analyze the performance of deadlock avoidance, and Detection Algorithms
CO5: Compare the paging techniques of memory management..

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E./B.Tech	16MA4108	PROBABILITY AND QUEUEING THEORY (CSE & IT)	3	1	0	4

Course Objective

1. Construct a well defined knowledge of random variables and standard distributions which can describe the real life phenomenon.
2. Know the concept of two dimensional Random variables and determine covariance, Regression.
3. Understand the concept of random processes and Markov process.
4. Provide the required mathematical support in real life problems and develop probabilistic models which can be used in several areas of science and engineering.
5. Apply the basic characteristic features of a queuing system and acquire skills in analyzing queuing models.

Unit	Description	Instructional Hours
I	**RANDOM VARIABLE AND STANDARD DISTRIBUTIONS** Random variable - Discrete and continuous random variables – Moments – Moment generating functions and their properties - Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions	12
II	**TWO DIMENSIONAL RANDOM VARIABLES** Joint distributions - Marginal and conditional distributions – Covariance – Correlation and regression.	12
III	**RANDOM PROCESSES** Classification - Stationary process - Markov process - Poisson process –Birth and death process–Markov chains - Transition probabilities - Limiting distributions.	12
IV	**MARKOVIAN QUEUES** Markovian models – Birth and death queueing models – Steady state results – Single and Multiple server Queueing models – Queues with finite waiting rooms –Little's formula. (Derivations excluded).	12
V	**NON–MARKOVIAN QUEUES AND QUEUEING NETWORKS** M/G/1 Queue – Pollaczek – Khintchine formula– Series queues – Open Networks-Open Jackson networks	12
	Total Instructional Hours	**60**

Course Outcome

CO1: Know the students will have an exposure of various distribution functions.
CO2: Understand the skills in handling situations involving more than one random variable.
CO3: A fundamental knowledge of the probability concepts and acquire skills in analyzing queueing models.
CO4: Understand and characterize phenomenon which evolve with respect to time in a probabilistic manner.
CO5: Identify the queuing model in the given system, find the performance measures and analyze the result.

TEXT BOOKS:

T1 - Gupta, S.C., & Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand & Sons, Reprint 2011

T2 - Veerarajan, T., Probability, Statistics and Random Processes, Tata McGraw-Hill, 2nd Edition, New Delhi, 2010.

REFERENCE BOOKS :

R1 - O.C. Ibe, "Fundamentals of Applied Probability and Random Processes", Elsevier, First Indian Reprint, 2009.

R2 - A.O. Allen, "Probability, Statistics and Queueing Theory with Computer Applications", Elsevier, Second Edition, 2005.

R3 - K.S. Trivedi, "Probability and Statistics with Reliability, Queueing and Computer Science Applications", John Wiley and Sons, Second Edition, 2002.

R4 - Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2004.

R5 - Yates. R.D. and Goodman. D. J., "Probability and Stochastic Processes", Wiley India Pvt. Ltd., Bangalore, 2nd Edition, 2012.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS4201	JAVA PROGRAMMING (CSE & IT)	3	0	0	3

Course Objective

1. Learn the basics of java programming language
2. Discuss the packages and interfaces in java programming
3. Learn input and output streams in java
4. Understand the event handling classes in java
5. Learn frames and windows in java and its applications

Unit	Description	Instructional Hours
I	**OVERVIEW OF JAVA PROGRAMMING** Review of Object oriented programming-Introduction to java programming-Features of Java Language, JVM -The Java Environment-Primitive Data types-variables-arrays-control statements-classes and objects-access specifier-methods-constructor-finalize method-strings-Inheritance – class hierarchy – polymorphism – dynamic binding – final keyword – abstract classes.	9
II	**PACKAGES AND INTERFACES** Packages-defining package-access protection-importing packages- interfaces-Defining an interface-implementing an interface-applying interface-variables in interface-extended interface-Exception Handling-exception types-uncaught exception-multiple catch-nested try-throw and finally-built-in exceptions-multithreaded programming-java thread model-thread priorities-synchronization-thread class and runnable interface-creating multiple threads- inter thread communication-string-input and output	9
III	**INPUT AND OUTPUT STREAMS** I/O basics-reading console input-writing console output-reading and writing files-applet fundamentals-Applet Basics-An Applet Skeleton-Simple Applet Display Methods-The HTML APPLET Tag-Passing Parameters to Applets-using instanceof-native method	9
IV	**EVENT HANDLING** The Delegation Event Model-Event Classes-The ActionEvent Class-The AdjustmentEvent Class-The ComponentEvent Class-The ContainerEvent Class-Event Listener Interfaces-The ActionListener Interface-The AdjustmentListener Interface-The ComponentListener Interface-The ContainerListener Interface-Using the Delegation Event Model-adapter class-inner classes.	9
V	**FRAMES AND WINDOWS** Window Fundamentals-Working with Frame Windows-Creating a Frame Window in an Applet-Displaying Information Within a Window-Working with Graphics-Drawing Lines-Drawing Rectangles-Drawing Ellipses and Circles-Working with Color-Working with Fonts.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: To Understand the Basics of java Programming
CO2: Design program using user defined packages and interfaces
CO3: Develop applications using applet class in java
CO4: Apply event handling classes to create different events in java
CO5: Design real time applications using frames and windows

TEXT BOOKS:

T1- Herbert Schildt, “The complete reference java 2”,seventh edition, McGraw – Hill 2007.

REFERENCE BOOKS :

R1 - E.Balagurusamy,”Programming with java A Primer”, fifth edition, McGraw – Hill 2014
R2 - H.M.Deitel, P.J.Deitel, "Java : how to program", Fifth edition, Prentice Hall of India private limited,2003.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS4202	MICRO PROCESSORS AND MICRO CONTROLLERS	3	0	0	3

Course Objective

1. Study the Architecture of 8086 microprocessor.
2. Learn the design aspects of I/O and Memory Interfacing circuits.
3. Study about communication and bus interfacing.
4. Study the Architecture of 8051 microcontroller
5. Study the concepts of microcontroller interfacing

Unit	Description	Instructional Hours
I	**THE 8086 MICROPROCESSOR** Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.	9
II	**8086 SYSTEM BUS STRUCTURE** 8086 signals – Basic configurations – System bus timing –System design using 8086 – IO programming – Introduction to Multiprogramming – System Bus Structure - Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.	9
III	**I/O INTERFACING** Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display , LCD display, Keyboard display interface and Alarm Controller.	9
IV	**MICROCONTROLLER** Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming	9
V	**INTERFACING MICROCONTROLLER** Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation..	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Design and implement programs on 8086 microprocessor.
CO2: Design I/O circuits.
CO3 Design Memory Interfacing circuits.
CO4: Design and implement 8051 microcontroller based systems.
CO5: Design various interfacing and its programming methodologies

TEXT BOOKS:

T1- Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Prentice Hall of India, 2011.
T2- Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Second Edition, Pearson education, 2011

REFERENCE BOOKS :

R1 - Doughlas V.Hall, "Microprocessors and Interfacing, Programming and Hardware",TMH,2012

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS4203	DATABASE MANAGEMENT SYSTEMS	3	0	0	3

Course Objective

1. To learn the data models, conceptualize and depict a database system using E-R diagram.
2. To learn SQL and relational database design.
3. To understand various normal forms
4. To understand the internal storage structures using different file and indexing techniques.
5. To know the concepts of transaction processing, concurrency control techniques and recovery procedure

Unit	Description	Instructional Hours
I	**INTRODUCTION** Introduction: Database system application, purpose of database system - View of Data –Database Languages- Data Storage and Querying-Database Architecture – Database design and E-R model: Overview of the design process- The Entity – Relationship Model-Constraints- Removing redundant attributes in Entity Sets- Entity – Relationship Diagram- Reduction to Relational Schemas-Entity Relationship Design Issues.	9
II	**RELATIONAL MODEL AND DATABASE DESIGN** Introduction to Relational Model – Formal Relational Query Languages - Introduction to SQL: Data definition Basic structure of SQL Queries-Additional Basic operations - Set operations-Aggregate functions-Nested sub queries- Intermediate SQL: Joins- Views – Integrity Constraints.	9
III	**DATABASE DESIGN AND NORMAL FORMS** Functional Dependencies – Normal Forms Based on primary Keys- General Definition of Second and Third Normal Form - Boyce Codd Normal Form – Algorithms for relational database schema design - Multivalued dependencies and Fourth Normal Form.	9
IV	**DATA STORAGE AND QUERY PROCESSING** Overview of Physical Storage Media – Magnetic disk Flash storage- RAID - File and Record Organization –Indexing and Hashing: Ordered Indices – B + Tree Index File- Static Hashing – Dynamic Hashing- Query Processing: Overview - measures of Query Cost.	9
V	**TRANSACTION MANAGEMENT** Transactions: Transaction concept– Transaction Atomicity and Durability- Transaction Isolation – Serializability -Transaction Isolation and Atomicity - Transaction Isolation levels-Implementation of Isolation Levels – Concurrency Control: Lock based protocols - Deadlock handling - Multiple Granularity - Time stamp based protocols – Recovery system: Failure classification – Storage - Recovery and atomicity – Recovery Algorithms.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Construct an Entity Relationship (ER) diagram for an application.
CO2: Create a normalized relational database model and write queries to generate reports from it.
CO3: Determine whether the transaction satisfies the ACID properties.
CO4: Apply various storage organization and query processing
CO5: Design various protocols and algorithms to manage the transactions and concurrency control

TEXT BOOKS:

T1- Abraham Silberschatz, Henry F. Korth and S. Sudharshan, "Database System Concepts", Sixth Edition, Tata Mc Graw Hill, 2011.

T2- Ramez Elmasri and Shamkant B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education, 2008.

REFERENCE BOOKS :

R1 - C.J.Date, A.Kannan and S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.

R2- Raghu Ramakrishnan, "Database Management Systems", Fourth Edition, Tata Mc Graw Hill, 2010.

R3- Rob Cornell, "Database Systems Design and Implementation", Cengage Learning, 2011.

R4- Atul Kahate, "Introduction to Database Management Systems", Pearson Education, New Delhi, 2006.

R5- Alexis Leon and Mathews Leon, "Database Management Systems", Vikas Publishing House Private Limited, New Delhi, 2003.

R6- G.K.Gupta, "Database Management Systems", Tata Mc Graw Hill, 2011

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS4204	COMPUTER GRAPHICS	3	0	0	3

Course Objective

1. Acquire knowledge about graphics devices, software and basic algorithms for geometric objects.
2. Understand the two dimensional graphics with their transformations and clipping techniques.
3. Understand the three dimensional graphics with their transformations and clipping techniques.
4. Gain knowledge about illumination methods, rendering and color models.
5. Understand the design of animations and its realistic features.

UNIT	DESCRIPTION	TOTAL INSTRUCTIONAL HOURS
I	**BASIC OF COMPUTER GRAPHICS** Basic of Computer Graphics-Applications of computer graphics, Display devices, Random and Raster scan systems, Graphics input devices, Graphics software and standards. Scan conversion: Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; Fill area primitives: scan-line polygon filling, inside-outside test, Scan-Line fill of Curved Boundary Areas boundary and flood-fill, line attributes, area-fill attributes, character attributes.	9
II	**2DTRANSFORMATION&VIEWING** Basic transformations: translation, rotation, scaling, matrix representation, homogeneous coordinates, composite transformations, reflection and shearing transformation. Viewing: viewing pipeline and coordinates system, window-to-viewport transformation, two dimensional viewing functions. Clipping: point clipping, line clipping (cohen-sutherland, liang- bersky, NLN), polygon clipping, curve clipping & text clipping.	9
III	**THREE DIMENSIONAL CONCEPTS** Three dimensional display methods, Three dimensional object representations – Polygon surfaces- Polygon tables- Plane equations – Polygon meshes; Curved Lines and surfaces, Quadratic surfaces, Blobby objects, spline representations, Bezier curves and surfaces -B-Spline curves and surfaces. 3D transformation: translation, scaling and rotation, composite transformation, viewing pipeline and coordinates, projection, visible surface detection methods.	11
IV	**OBJECT RENDERING, ILLUMINATION & COLOR MODELS** Basic illumination methods - ambient, diffuse reflection, specular reflection and the phong model, warn model, Surface-rendering- gouraurd shading, phong shading, constant intensity shading, Color models-properties of light, XYZ, RGB, YIQ and CMY color models	7
V	**COMPUTER ANIMATIONS & REALISM** ANIMATION: Design of Animation sequences – animation function – raster animation – key frame systems – motion specification –morphing – tweening. REALISM: Recursively defined curves – Koch curves – C curves – Dragons – space filling curves –-fractals-Mandelbrot sets – Julia Sets – Random Fractals –overview of ray tracing.	9
	TOTAL INSTRCTIONAL HOURS	**45**

Course Outcome

CO1. Design and manipulate graphical objects.
CO2. Apply two dimensional transformations and clipping techniques to graphics.
CO3. Design three dimensional graphics and apply three dimensional transformations.
CO4. Apply Illumination, shading and colors to objects.
CO5. Design animation sequences and various curves.

TEXT BOOKS:

T1. Donald Hearn and Pauline Baker M, "Computer Graphics", Prentice Hall, New Delhi, 2007.
T2. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education, 2007.

REFERENCE BOOKS :

R1. Jeffrey McConnell, "Computer Graphics: Theory into Practice", Jones and Bartlett Publishers, 2006.
R2. Hill F S Jr., "Computer Graphics", Maxwell Macmillan" , 1990.
R3. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, Kelvin Sung, and AK Peters, Fundamental of Computer Graphics, CRC Press, 2010.
R4. William M. Newman and Robert F.Sproull, "Principles of Interactive Computer Graphics", Mc Graw Hill 1978.
R5. http://nptel.ac.in

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS4205	FUNDAMENTAL OF ALGORITHMS	3	0	0	3

Course Objective

1. Learn the algorithm analysis techniques.
2. Become familiar with the different algorithm design techniques
3. Learn greedy technique to solve problems
4. Understand backtracking and iterative development of algorithms
5. Understand the limitations of Algorithm power

Unit	Description	Instructional Hours
I	**ANALYSIS OF ALGORITHM** Introduction – Algorithms- Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving- Analysis Framework – Asymptotic Notations and its properties – Mathematical analysis for Recursive and Non-recursive algorithms	9
II	**BRUTE FORCE AND DIVIDE-AND-CONQUER** Brute Force – Closest-Pair and Convex-Hull Problems-Exhaustive Search – Traveling Salesman Problem – Knapsack Problem – Assignment problem- Divide and conquer methodology – Merge sort – Quick sort – Binary search – Multiplication of Large Integers- Single Source Shortest Path Algorithm	9
III	**DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE** Computing a Binomial Coefficient – All Pairs Shortest Path Algorithm -Warshall's and Floyd' algorithm – Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique–MST- Prim's algorithm- Kruskal's Algorithm- Dijkstra's Algorithm-Huffman Trees	9
IV	**BACKTRACKING AND ITERATIVE IMPROVEMENT** The Simplex Method-The Maximum-Flow Problem – maximum Matching in Bipartite Graphs- The Stable marriage Problem- The General Method – 8-Queens Problem- Sum of Subsets – Graph Coloring- Hamiltonian Cycle	9
V	**P AND NP COMPLETENESS** Decision Trees -Polynomial time – Nondeterministic Algorithms and NP – Reducibility and NP completeness – NP complete Problems – Approximation Algorithms for NP- More on NP completeness	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Design algorithms for various computing problems
CO2: Analyze the time and space complexity of algorithms
CO3: Critically analyze the different algorithm design techniques for a given problem
CO4: Modify existing algorithms to improve efficiency
CO5: Apply algorithm techniques for real time applications

TEXT BOOKS:

T1- Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.
T2- Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012

REFERENCE BOOKS :

R1 - Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education,Reprint 2006.
R2- Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Education, 2009. Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008.
R3- E.Horowitz , Sahni & Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Galgotia Publications,1997.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS4001	JAVA PROGRAMMING LABORATORY (CSE & IT)	0	0	4	2

Course Objective

1. Be familiarized with good programming design methods
2. Study the basic object oriented concepts of Java
3. Develop a system using event driven programming paradigm
4. Learn about the database connectivity using Java and client server communications
5. Getting exposure in implementing the different applications using java

Expt. No.	Description of the Experiments
1.	Develop Rational number class in Java. Use JavaDoc comments for documentation. Your implementation should use efficient representation for a rational number, i.e. (500 / 1000) should be represented as (½).
2.	Develop Date class in Java similar to the one available in java.util package. Use JavaDoc comments.
3.	Implement Lisp-like list in Java. Write basic operations such as 'car', 'cdr', and 'cons'. If L is a list [3, 0, 2, 5], L.car() returns 3, while L.cdr() returns [0,2,5].
4.	Design a Java interface for ADT Stack. Develop two different classes that implement this interface, one using array and the other using linked-list. Provide necessary exception handling in both the implementations.
5.	Design a Vehicle class hierarchy in Java. Write a test program to demonstrate polymorphism
6.	Design classes for Currency, Rupee, and Dollar. Write a program that randomly generates Rupee and Dollar objects and write them into a file using object serialization. Write another program to read that file, convert to Rupee if it reads a Dollar, and while leave the value as it is if it reads a Rupee.
7.	Design a scientific calculator using event-driven programming paradigm of Java.
8.	Write a multi-threaded Java program to print all numbers below 100,000 that are both prime and fibonacci number (some examples are 2, 3, 5, 13, etc.). Design a thread that generates prime numbers below 100,000 and writes them into a pipe. Design another thread that generates fibonacci numbers and writes them to another pipe. The main thread should read both the pipes to identify numbers common to both.
9.	Develop a simple OPAC system for library using even-driven and concurrent programming paradigms of Java. Use JDBC to connect to a back-end database
10.	Develop multi-threaded echo server and a corresponding GUI client in Java
11.	[Mini-Project] Develop a programmer's editor in Java that supports syntax highlighting, compilation support, debugging support, etc.
12.	Write a java program that prints the meta-data of a given table.

TOTAL PRACTICAL HOURS 45

Course Outcome

CO1: Apply good programming design methods for program development.
CO2: Apply the different event driven programming for implementing solutions to practical problems.
CO3: Design and implement polymorphism, exception handling and multi threading in java.
CO4: Ability to access data from a DB with Java programs.
CO5: Able to create client server communication for data sharing using Java

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS4002	DATABASE MANAGEMENT AND SYSTEMS LABORATORY	0	0	4	2

Course Objective

1. To learn the fundamental concepts of SQL queries.
2. To understand the concept of designing a database with the necessary attributes.
3. To know the methodology of Accessing, Modifying and Updating data and information from the relational databases.

Expt. No.	Description of the Experiments
1.	Working with SQL commands like DDL, DML, TCL, DCL
2.	Performing Single-row functions and group functions in SQL.
3.	Execute simple queries using joins and Integrity constraints
4.	Creation and manipulation of database objects (Views, Synonyms, Sequence, Indexes, Save point).
5.	Simple programs using PL/SQL block.
6.	Implementation of cursor in PL/SQL block.
7.	Generate trigger in PL/SQL block.
8.	Write PL/SQL block Programs using exception handling.
9.	Design PL/SQL blocks using subprograms namely functions and procedures.
10.	Mini project.

TOTAL PRACTICAL HOURS 45

Course Outcome

CO1: Design and implement a database schema for a given problem-domain.
CO2: Populate and query a database
CO3: Create and maintain tables using PL/SQL.
CO4: Prepare reports for maintaining databases
CO5: Able to utilize various constraints for managing database

PROGRAMME	COURSECODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS4003	MICROPROCESSORS AND MICRO CONTROLLERS LABORATORY	0	0	4	2

Course Objective

1. Introduce ALP concepts and features
2. Write ALP for arithmetic and logical operations in 8086 and 8051
3. Differentiate Serial and Parallel Interface
4. Interface different I/Os with Microprocessors
5. Be familiar with MASM

Expt. No.	Description of the Experiments
1.	Basic arithmetic and Logical operations.
2.	Code conversion, decimal arithmetic and Matrix operations.
3.	Floating point operations, string manipulations, sorting and searching
4.	Counters and Time Delay
	Peripherals and Interfacing Experiments
5.	Traffic light control
6.	Stepper motor control
7.	Key board and Display
8.	Serial interface and Parallel interface
9.	A/D and D/A interface and Waveform Generation
	8051 Experiments using kits and MASM
10.	Basic arithmetic and Logical operations.
11.	Square and Cube program, Find 2"s complement of a number
12.	Unpacked BCD to ASCII

TOTAL PRACTICAL HOURS 45

Course Outcome

CO1: Write ALP Programmes for fixed and Floating Point and Arithmetic
CO2: Interface different I/Os with processor
CO3: Generate waveforms using Microprocessors.
CO4: Execute Programs in 8051
CO5: Explain the difference between simulator and Emulator

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS5201	COMPUTER NETWORKS (CSE & IT)	3	0	0	3

Course Objective

1. Understand the division of network functionalities into layers.
2. Be familiar with the components required to build different types of networks
3. Be expose to the required functionality at each layer
4. Learn the flow control and congestion control algorithms
5. Have knowledge in different applications that use computer networks

Unit	Description	Instructional hours
I	**INTRODUCTION &DATA LINK LAYER** Building a network – Requirements – Layering and protocols – Internet Architecture – networking devices – modems, routers, switches, gateways; Link layer Services – Framing – Error Detection – Flow control- media access control.	10
II	**DATA COMMUNICATION** Signal characteristics – Data transmission – Physical links and transmission media – Signal encoding techniques - Channel access techniques – TDM – FDM-CDM	8
III	**NETWORK AND ROUTING** Circuit switching – packet switching – virtual circuit switching – Routing–– RIP – OSPF - – IPv6-Metrics- IP – Global Address –– Subnetting – CIDR - ARP – DHCP.	9
IV	**TRANSPORT LAYER** Overview of Transport layer – UDP – Reliable byte stream (TCP) – Connection management – Flow control – Retransmission – TCP Congestion control – Congestion avoidance (DECbit, RED) – QoS – Application requirements	9
V	**APPLICATION LAYER** Traditional applications -Electronic Mail (SMTP, POP3, IMAP, MIME) – HTTP – Web Services – DNS – SNMP	9
	Total Instructional Hours	45

Course Outcome

CO1: Identify the components required to build different types of networks and Explain the data link layer protocols
CO2: Outline the data communication system and the purpose of layered architecture
CO3: Choose the required functionality at each layer for given application
CO4: Identify solution for each functionality at each layer
CO5: Trace the flow of information from one node to another node in the network

TEXT BOOK:

T1: Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers, 2011.
T2:Behrouz A. Forouzan, "Data communication and Networking", Fourth Edition, Tata McGraw – Hill, 2011.

REFERENCES:

R1: James F. Kurose, Keith W. Ross, "Computer Networking – A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education, 2009.
R2: Nader. F. Mir, "Computer and Communication Networks", Pearson Prentice Hall Publishers, 2010.
R3: Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill Publisher, 2011.
R4: Andrew S Tanenbaum, David J. Wetherall "Computer Networks", Prentice Hall of India Pearson Education, New Delhi, 2010.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS5202	FREE OPEN SOURCE SOFTWARE - I	3	0	0	3

Course Objective

1. This course provides an overview of the historical and modern context and operation of free and open source software (FOSS) communities and associated software projects.
2. The practical objective of the course is to teach students how they can begin to participate in a FOSS project in order to contribute to and improve aspects of the software that they feel are wrong.
3. Students will learn some important FOSS tools and techniques for contributing to projects and how to set up their own FOSS projects.
4. Students will learn some important FOSS versions and its working in real time projects
5. Students will learn some important FOSS programming language.

UNIT	DESCRIPTION	TOTAL INSTRUCTIONAL HOURS
I	**INTRODUCTION** Introduction to Open sources – Need of Open Sources – Advantages of Open Sources– Application of Open Sources. List of open source software and open source hardware -Open source operating systems: LINUX: Introduction – General Overview – Kernel Mode and user mode – Process – Advanced Concepts – Scheduling – Personalities – Cloning – Signals – Development with Linux.	**8**
II	**OPEN SOURCE DATABASE** MySQL: Introduction – Setting up account – Starting, terminating and writing your own SQL programs – Record selection Technology – Working with strings – Date and Time– Sorting Query Results – Generating Summary – Working with metadata – Using sequences –MySQL and Web.	**10**
III	**OPEN SOURCE PROGRAMMING LANGUAGES** PHP: Introduction – Programming in web environment – variables – constants – data types – operators – Statements – Functions – Arrays – OOP – String Manipulation and regular expression – File handling and data storage – PHP and SQL database – PHP and LDAP – PHP Connectivity – Sending and receiving E-mails – Debugging and error handling – Security – Templates. case study- Symfony**.**	**10**
IV	**PYTHON** Syntax and Style – Python Objects – Numbers – Sequences – Strings – Lists and Tuples – Dictionaries – Conditionals and Loops – Files – Input and Output – Errors and Exceptions – Functions – Modules – Classes and OOP – Execution Environment.	10
V	**PYTHON DATABASES AND PERSISTENCE** Persistence options in python-DBM Files-Pickled Objects-Shelve Files-The ZODB Object- Oriented Database-SQL Database Interfaces- ORMs: Object Relational Mappers- PyForm: A Persistent Object Viewer	**7**
	TOTAL INSTRCTIONAL HOURS	**45**

Course Outcome

CO1. Ability to install and run open-source operating systems.
CO2. Ability to gather information about Free and Open Source Software projects from software releases and from sites on the internet.
CO3. Ability to build and modify one or more Free and Open Source Software packages.
CO4. Ability to use a version control system and to interface with version control systems used by development communities.
CO5. Ability to install various software and tools packages

TEXT BOOKS:

T1.Remy Card, Eric Dumas and Frank Mevel, "The Linux Kernel Book", Wiley Publications, 2003
T2.Steve Suchring, "MySQL Bible", John Wiley, 2002
T3.Mark Lutz, "Programming Python 4th Edition" , O'Reilly Publication, 2010

REFERENCE BOOKS :

R1- Rasmus Lerdorf and Levin Tatroe, "Programming PHP", O'Reilly, 2002
R2- Wesley J. Chun, "Core Phython Programming", Prentice Hall, 2001
R3- Steven Holzner, "PHP: The Complete Reference", 2nd Edition, Tata McGraw-Hill Publishing Company Limited, Indian Reprint 2009.
R4.Vikram Vaswani, "MYSQL: The Complete Reference", 2nd Edition, Tata McGraw- Hill Publishing Company Limited, Indian Reprint 2009.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS5203	COMPUTER ARCHITECTURE	3	0	0	3

Course Objective

1. Give students a broad and deep knowledge of contemporary computer architecture issues and techniques.
2. Give students knowledge of advanced hardware-based techniques for exploiting instruction level parallelism.
3. Give students ability to apply the learned knowledge to conduct computer architecture research using performance simulators.
4. Give the students ability to learned knowledge to work in various computer components.
5. Give the student about the wide knowledge about the current system working with the existing mechanisms.

UNIT	DESCRIPTION	TOTAL INSTRUCTIONAL HOURS
I	**INTRODUCTION & INSTRUCTIONS** Brief history of computers- Eight ideas – Components of a computer system – Technology – Performance – Power wall –Uniprocessors to multiprocessors; Instructions – operations and operands – representing instructions– Logical operations – control operations – Addressing and addressing modes.	9
II	**COMPUTER ARITHMETIC** The Arithmetic and Logic Unit (ALU) - Integer Representation - Integer Arithmetic - Floating-Point Representation - Floating-Point Arithmetic	8
III	**PROCESSOR AND CONTROL UNIT** Basic MIPS implementation – Building datapath – Control Implementation scheme – Pipelining –Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions	10
IV	**PARALLELISM** Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardwaremultithreading – Multicore processors	9
V	**MEMORY AND I/O SYSTEMS** Computer Memory System Overview - Cache Memory Principles – Elements of Cache Design - Virtual memory, TLBs - Input/output system, programmed I/O, DMA and interrupts	9
	TOTAL INSTRCTIONAL HOURS	45

Course Outcome

CO1. Identify the factors affecting performance in superscalar processors and the key components, options and tradeoffs that a designer has to consider when design
CO2. Identify various simulation techniques used to study superscalar processor performance.
CO3. Compare a trace cache to conventional instruction cache and explain advantages and disadvantages of each approach.
CO4. Parallel processing of process and task are learned.
CO5. The computer over all working and the inter process communication between the hardware are learned

TEXT BOOKS:

T1. David A. Patterson and John L. Hennessey, "Computer organization and design', MorganKauffman / Elsevier, Fifth edition, 2014.
T2. William Stallings "Computer Organization and Architecture", Eighth Edition, PearsonEducation, 2010.

REFERENCE BOOKS :

R1. V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation",VIth edition, Mc Graw-Hill Inc, 2012.
R2. Vincent P. Heuring, Harry F. Jordan, "Computer System Architecture", Second Edition,Pearson Education, 2005.
R3. Govindarajalu, "Computer Architecture and Organization, Design Principles and Applications",first edition, Tata McGraw Hill, New Delhi, 2005.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS5204	THEORY OF COMPUTATION (CSE & IT)	3	0	0	3

Course Objective

1. Understand about Finite State Machine
2. Learn Regular expressions
3. Understand the various types of Grammars and Pushdown Automata
4. Expose the Turing Machine concept
5. Understand about Decidability and Un-decidability of various problems.

Unit	Description	Instructional Hours
I	**FINITE AUTOMATA** Introduction- Basic Mathematical Notation and techniques- Finite State systems – Basic Definitions – Finite Automaton – DFA & NDFA – Finite Automaton with €- moves- Equivalence of DFA and NFA- NFA to DFA conversion-Applications of finite automata.	9
II	**REGULAR EXPRESSIONS** Regular Languages- Regular Expression- Converting Regular Expression to FA- Converting FA to Regular Expression - Equivalence of finite Automaton and regular expressions –Minimization of DFA- - Pumping Lemma for Regular sets – Problems based on Pumping Lemma.	9
III	**GRAMMARS AND PUSHDOWN AUTOMATA** Chomsky hierarchy of languages-Context-Free Grammar (CFG) - Parse Trees - Ambiguity in grammars and languages - Definition of the Pushdown automata - Languages of a Pushdown Automata - Equivalence of Pushdown automata and CFG, Deterministic Pushdown Automata- Normal forms for CFG – Chomsky Normal Form (CNF) – Greibach Normal Form (GNF) - Pumping Lemma for Context Free Language (CFL) - Closure Properties of CFL.	9
IV	**TURING MACHINE** Definitions of Turing machines – Models – Computable languages and functions –Techniques for Turing machine construction – Multi head and Multi tape Turing Machines - The Halting problem – Partial Solvability – Problems on Turing machine.	9
V	**COMPUTATIONAL COMPLEXITY** Undecidability- Basic definitions- Decidable and undecidable problems-Properties of Recursive and Recursively enumerable languages – PCP – MPCP. Introduction to Computational Complexity: Definitions-Time and Space complexity of TMs–Complexity classes – Introduction to NP-Hardness and NP-Completeness	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Design Finite State Machine, Pushdown Automata, and Turing Machine.
CO2: Create a grammar or check a grammar through various procedures
CO3: Determine the push down automata and tis storage organization.
CO4: Analyze the problems about Turing Machines.
CO5: Explain the Decidability or Undecidability of various problems and Able to understand the NP Completeness

TEXT BOOKS:

T1- Hopcroft J.E., Motwani R. and Ullman J.D, "Introduction to Automata Theory, Languages and Computations", Second Edition, Pearson Education, 2008.

T2- John C Martin, "Introduction to Languages and the Theory of Computation", Third Edition, Tata Mc Graw Hill Publishing Company, New Delhi, 2007.

REFERENCE BOOKS :

R1 - Mishra K L P and Chandrasekaran N, "Theory of Computer Science - Automata, Languages and Computation", Third Edition, Prentice Hall of India, 2004.

R2- Harry R Lewis and Christos H Papadimitriou, "Elements of the Theory of Computation", Second Edition, Prentice Hall of India, Pearson Education, New Delhi, 2003.

R3- Peter Linz, "An Introduction to Formal Language and Automata", Third Edition, Narosa Publishers, New Delhi, 2002.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS5001	NETWORKS LABORATORY (CSE & IT)	0	0	4	2

Course Outcome

1. Use simulation tools.
2. Implement the various protocols.
3. Analyse the performance of the protocols in different layers.
4. Analyze various routing algorithms.
5. Analyze various real time problems for projects.

Expt. No.	Description of the Experiments
1.	Implementation of Stop and Wait Protocol and Sliding Window Protocol
2.	Study of Socket Programming and Client – Server model
3.	Write a code simulating ARP /RARP protocols
4.	Write a code simulating PING and TRACEROUTE commands
5.	Create a socket for HTTP for web page upload and download
6.	Write a program to implement RPC (Remote Procedure Call)
7.	Implementation of Subnetting
8.	Applications using TCP Sockets like a. Echo client and echo server b. Chat c. File Transfer
9.	Applications using TCP and UDP Sockets like d. DNS e. SNMP f. File Transfer
10.	Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer. a. Link State routing b. Flooding c. Distance vector

Total Practical Hours 45

Course Outcome

CO1:Use simulation tools
CO2: Implement the various protocols
CO3: Analyze the performance of the protocols in different layers
CO4: Analyze various routing algorithms
CO5: Learn about the network simulation

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE

- Turbo C++ Compiler
- Operating System (Windows, UNIX, Linux...)

HARDWARE

Standalone desktops : 30 Nos

REFERENCE : spoken-tutorial.org

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS5002	OPEN SOURCE PROGRAMMING LABORATORY I	0	0	4	2

Course Objective

1. Common open source software licenses, open source project structure, distributed team software development, and current events in the open source world
2. Explain common open source licenses and the impact of choosing a license
3. Installation of open source software and tools.

S.NO	DESCRIPTION OF THE EXPERIMENTS
1	Windows and Linux installation with dual boot.
2	Micro kernel installation like MYSQL, PHP and PYTHON
3	Running PHP: Simple applications like login forms
4	To implement the following the concept using PHP File handling Exception handling Database connectivity
5	Running Python: some simple exercise – e.g. control flow statement, string manipulation and function
6	To implement Python's data structures - lists, dictionaries, and tuples in detail.
7	To implement the following the concept using PYTHON File handling Exception handling Database connectivity
8	To implement PYTHON GUI program using Django
	TOTAL INSTRCTIONAL HOURS **45**

Course Outcome

CO1. To use a version control system and to interface with version control systems used by development communities.
CO2. To contribute software to and interact with Free and Open
CO3. Source Software development projects.

REFERENCE:
Spoken-tutorial.org

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE: Latest distribution of Linux
HARDWARE: Standalone desktops 30 Nos

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS5701	TECHNICAL SEMINAR	0	0	4	2

Course Objective

1. To encourage the students to study advanced engineering developments.
2. To prepare and present technical reports.
3. To encourage the students to use various teaching aids such as over head projectors, power point presentation and demonstrative model.
4. To promote and develop presentation skills and import a knowledgeable society.
5. To set the stage for future recruitment by potential employers.

Expt. No.	Description of the Experiments
1.	During the seminar session each student is expected to present a topic on engineering/ technology, for duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present the seminar each student is expected to present at least twice during the semester and the student is evaluated based on that. At the end of the semester, the students have to submit a report on their topic of seminars. The Report will be evaluated and marks will be given. A faculty guide will be allotted to monitor the progress of the student and also to maintain attendance.
	Total Practical Hours 45

Course Outcome

Upon completion of this course, the students will be able to
CO1: Ability to review, prepare and present technological developments
CO2: Ability to face the placement interviews
CO3: Develops Communication Confidence skills
CO4: Builds Confidence
CO5: Utilize Technical Resources

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
BE	16CS6201	FREE OPEN SOURCE SOFTWARE II	3	0	0	3

Course Objective

1. Provides an overview of the historical and modern context of free and open source software (FOSS)
2. Gain Knowledge about Web server and Web Services
3. To learn about NS2 Simulator
4. Study important FOSS tools and techniques
5. To learn knowledge about Python Programming

Unit	Description	Instructional Hours
I	**WEB SERVICE** Web Server: Apache Web server – Working with Web Server – Configuring and Using apache web services MDA: Introduction to MDA – Genesis of MDA – Meta Object Facility – UML – UML Profiles – MDA Applications. case study: Apache Spark	9
II	**NS2** Introduction to Network Simulator 2-Linkage Between OTcl and C++ in NS2-Network Objects: Creation, Configuration, and Packet Forwarding	9
III	**PYTHON REGULAR EXPRESSION** Introducing Regular Expressions-Regular Expressions with Python-Grouping-Look Around-Performance of Regular Expressions.	9
IV	**PYTHON NLP** Language Processing and Python - Accessing Text Corpora and Lexical Resources-Processing Raw Text-Writing Structured Programs-Categorizing and Tagging Words	9
V	**PYTHON NLP** Learning to Classify Text-Extracting Information from Text-Analyzing Sentence Structure-Analyzing Sentence Structure-Analyzing the Meaning of Sentences-Managing Linguistic Data.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Ability to install and run open-source operating systems
CO2:Ability to gather information about Free and Open Source Software projects from software releases and from sites on the internet
CO3: Ability to build and modify one or more Free and Open Source Software packages
CO4: Ability to use a version control system and to interface with version control systems used by development communities
CO5: Ability to contribute software to and interact with Free and Open Source Software development projects

TEXT BOOKS:

T1 - Issariyakul, Teerawat, Hossain, Ekram "Introduction to Network Simulator NS2",Springer,2012
T2 - Steven Bird, Ewan Klein, and Edward Loper, "Natural Language Processing with Python",oreilly,2009

REFERENCE BOOKS:

R1 - Mark Lutz, "Learning Python" 5th Edition.Published by O'Reilly Media 2013
R2 - Eitan Altman "NS simulator for beginners"

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS6202	COMPILER DESIGN	3	0	0	3

Course Objective

1. Learn the design principles of a Compiler.
2. To introduce the various techniques involved in the translation of source programs into object programs by a compiler
3. Learn the various parsing techniques and different levels of translation
4. To understand the inner working of a compiler using the various data structures used in the translation process
5. Learn how to optimize and effectively generate machine codes

Unit	Description	Instructional Hours
I	**INTRODUCTION TO COMPILERS** Introduction - Analysis of the source program -Translators-Compilation and Interpretation-Language processors -The Phases of Compiler-Errors Encountered in Different Phases-The Grouping of Phases-Compiler Construction Tools.	5
II	**LEXICAL ANALYSIS** Lexical Analysis-Need and Role of Lexical Analyzer- Lexical Errors- Specification of tokens - Recognition of tokens -Expressing Tokens by Regular Expressions-Converting Regular Expression to DFA- Minimization of DFA-Language for Specifying Lexical Analyzers-LEX-Design of Lexical Analyzer for a sample Language	9
III	**SYNTAX ANALYSIS** Syntax analysis -Need and Role of the Parser-Context Free Grammars -Top Down Parsing - General Strategies-Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser- LR (0)Item-Construction of SLR Parsing Table -Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC-Design of a syntax Analyzer for a Sample Language	10
IV	**SYNTAX DIRECTED TRANSLATION & RUN TIME ENVIRONMENT** Syntax directed Definitions-S-attributed definitions - L-attributed definitions -Construction of Syntax Tree- Bottom-up and Top-down translation - type checking - Design of predictive translator - Type Systems-Specification of a simple type checker-Equivalence of Type Expressions-Type Conversions.RUN-TIME ENVIRONMENT: Source Language Issues-Storage Organization-Storage Allocation-Access to non- local names-Parameter Passing-Symbol Tables-Dynamic Storage Allocation	12
V	**CODE OPTIMIZATION AND CODE GENERATION** Intermediate code generation - Intermediate languages - Declarations - Assignment statements – Boolean Expressions - Procedure calls - Introduction to code optimization – Principal sources of optimization - DAG- Optimization of Basic Blocks -Introduction to global data-flow analysis - Introduction to code generation - Issues in the design of a code generator - The target machine - A simple code generator	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Able to known the various techniques involved in translation
CO2: Able to design and implement a prototype compiler
CO3: Able to apply various code optimization techniques
CO4: Able to apply various code generation techniques
CO5: Able to use the different compiler construction tools

TEXT BOOKS:

T1 - Alfred V Aho, Monica S. Lam, Ravi Sethi and Jeffrey D Ullman, “Compilers – Principles, Techniques and Tools”, 2nd Edition, Pearson Education, 2007.

REFERENCE BOOKS:

R1 - Randy Allen, Ken Kennedy, “Optimizing Compilers for Modern Architectures: A Dependence-based Approach”, Morgan Kaufmann Publishers, 2002.
R2 - Steven S. Muchnick, “Advanced Compiler Design and Implementation, “Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.

R3 - Keith D Cooper and Linda Torczon, “Engineering a Compiler”, Morgan Kaufmann Publishers Elsevier Science, 2004.
R4 - Charles N. Fischer, Richard. J. LeBlanc, “Crafting a Compiler with C”, Pearson Education, 2008
R5 - Aho A. V., Ullman J.D. Principles of Compiler Design, Narosa
R6 - Holub A.I., Compiler Design in C, Prentice Hall India
R7 - Appel A.W., Modern Compiler Implementation in C, Cambridge University Press
R8 - Dick Grune, Henri E Bal, Ceriel J.H Jacobs, Koen G Langendoen, Modern Compiler design, Dreamtech.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
BE	16CS6203	INTERNET OF THINGS	3	0	0	3

Course Objective

1. Learn the components of IOT
2. Learn about the IOT objects
3. Understand the components and the protocols in Internet.
4. Understand the various modes of communications with internet.
5. Understand the various cloud services for IOT

Unit	Description	Instructional Hours
I	**INTRODUCTION TO INTERNET OF THINGS** Definition and Characteristics of IoT, Physical Design of IoT-n IoT Protocols, IoT communication models, Iot Communication APIs IoT enabled Technologies-Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates.	9
II	**PROTOTYPING IOT OBJECTS USING MICROPROCESSOR/MICROCONTROLLER** Overview of Microprocessor and Microcontroller, Basics of Sensors and actuators-examples and working principles of sensors and actuators, Equivalent Microcontroller platform-Setting up the board-Programming for IOT-Reading from Sensors, Communication: Connecting microcontroller with mobile devices-communication through bluetooth, wifi, Ethernet.	11
III	**IOT ARCHITECTURE AND PROTOCOLS** Introduction, State of the art, Architecture Reference Model-Introduction, Reference Model and architecture, IoT reference Model-Zigbee, RFID, BLE, NFC , BACnet , 6LowPAN, RPL, CoAP, MQTT**.**	9
IV	**DEVICE DISCOVERY** Device Discovery capabilities-Registering a device, De-register a device, Querying for devices. Technologies available -IBM Foundation Device Management Service, Intel IOTivitiy, XMPP Discovery extension.	8
V	**CLOUD SERVICES FOR IOT** Introduction to Cloud Storage models and communication APIs Webserver -Web server for IoT, Cloud for IoT, Python web application framework designing a RESTful web API, Amazon Web services for IOT.	8
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Identify the components of IOT
CO2: Design a portable IOT using appropriate boards
CO3: Explore the IOT architecture and protocols
CO4: Develop schemes for device discovery.
CO5: Explicate the use of cloud services for IOT

REFERENCE BOOKS:

1.Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, From Machine -to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.

2.Vijay Madisetti and ArshdeepBahga, Internet of Things (A Hands-on-Approach), 1stEdition, VPT, 2014.

3.Francis daCosta, Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, 1st Edition, Apress Publications, 2013

4.Olivier Hersent, David Boswarthick, Omar Elloumi , The Internet of Things Key applications and Protocols, Wiley, 2012

5.Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud (Make: Projects) [Kindle Edition] by CunoPfister ,2011

6. Designing the Internet of Things (Nov 2013) by Adrian McEwen &Hakim Cassimally

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS6204	SOFTWARE QUALITY ASSURANCE	3	0	0	3

Course Objective

1. Understand the quality management framework and related quality program concepts
2. Understand commercial standards and the impact on quality assurance
3. Study the relationship of process and product quality assurance (PPQA) to SQA
4. Learn the quality management in information technology
5. Study the metrics for software quality assurance

Unit	Description	Instructional Hours
I	**ORGANIZING QUALITY MANAGEMENT** Quality management framework - Quality program concepts - Organizational aspects of quality program -Quality Program organizational relationship-Mapping quality program functions to project organizational entities	7
II	**SOFTWARE QUALITY ASSURANCE STANDARDS** Software Quality Assurance (SQA) in ISO standards-SQA in IEEE standards IEEE STD 730 - 2002-IEEE STD 829-1998-IEEE STD 1028-1997- ITIL standards- ANSI/EIA Standards and RTLA/DO standards	8
III	**SOFTWARE QUALITY ASSURANCE** Identifying SQA personnel needs-Characteristics of a good SQA engineer-SQA engineering staff-Pareto principle applied to SQA-Software inspections and walkthroughs-Measurements-Transition of cost to quality - Software audit-Performing the audit - Software safety and its relation to SQA-PPQA relationship to SQA	11
IV	**QUALITY MANAGEMENT IN IT** ITSM Processes-IT best practices-ITSM standards-Process improvement models-Customer requirements- Monitoring and measuring ITSM performance - Procurement quality-IT quality professional-Cost of software quality system CoSQ system to organization	11
V	**SQA METRICS** Software quality indicators-PSM -CMMI- PSP and TSP-Six sigma - Seven quality control tools: traditional and modern tools-check sheet-Pareto diagram-Histogram-Run chart-Scatter diagram-Control chart	8
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1.Identify the quality management framework and related quality program concepts.
CO2. Analyze the commercial standards and the impact on quality assurance.
CO3.Analyze the relationship of process and product quality assurance (PPQA) to SQA.
CO4.Explore the quality management in information technology.
CO5.Elucidate Software quality metrics methodology and software quality control tools.

REFERENCES

1. Schulmeyer G. Gordon, Handbook of Software Quality Assurance. London: Artech House Inc,2008
2. Daniel Galin, Software Quality Assurance from theory to implementation, Pearson Education Limited, 2009
3. Stephen H. Kan. Metrics and Models in Software Quality Engineering, Addison-Wesley Professional, 2003
4. Murali Chemuturi, Mastering Software Quality Assurance: Best Practices, Tools and Techniques for Software Developers, J. Ross Publishing Inc, 2011
5. Murali Chemuturi, Mastering Software Quality Assurance: Best Practices, Tools and Techniques for Software Developers, J. Ross Publishing Inc, 2011

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS6001	OPEN SOURCE PROGRAMMING LABORATORY II	0	0	4	2

Course Objective

1.To expose students to FOSS environment
2. To introduce the use of open source packages.
3. To provide practical experience in software development using open source tools like Perl, Python, PHP and MySql

Expt. No.	Description of the Experiments
1.	Develop a necessary class and method of sorting algorithms such as bubble sort, insertion sort, merge sort, and quick sort.
2.	Develop a Linked List Class and its Methods and implement Stack and Queue concept.
3.	Develop a database connection program and implement the following concept a. Inheritance b. Overloading c. Overriding d. Data hiding
4.	To implement the following concept using regular expression a. Remove duplicate word b. Find a phone number in a list c. Validate E-mail address
5.	Install the NLP package and implement the following concept a. Extracting Information from Text b. Learning to Classify Text c. Building Feature Based Grammars
6.	Mini project (Application Development using PYTHON / MYSQL) a. Inventory Control System. b. Material Requirement Processing. c. Hospital Management System. d. Railway Reservation System. e. Personal Information System. f. Web Based User Identification System. g. Timetable Management System. h. Hotel Management System

TOTAL PRACTICAL HOURS 45

Course Outcome

CO1: Understand, analyze and apply the role of languages like HTML, DHTML, CSS, JavaScript and PHP
CO2: Analyze a web page and identify its elements and attributes
CO3: Create web pages using HTML, DHTML and Cascading Style Sheets
CO4: Create dynamic web pages using JavaScript, XML.
CO5: Build web applications using PHP

REFERENCE:
Spoken-tutorial.org

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE: Latest distribution of Linux
HARDWARE: Standalone desktops 30 Nos

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS6002	COMPILER DESIGN LABORATORY	0	0	4	2

Course Objective

1. Be exposed to compiler writing tools.
2. Learn to implement the different Phases of compiler
3. Be familiar with control flow and data flow analysis.

Expt. No.	Description of the Experiments
1.	Design a lexical analyzer for given language and the lexical analyzer should ignore redundant spaces, tabs, comments and new lines. Although the syntax specification states that the identifiers can be arbitrary long, you may restrict the length to some reasonable value. Simulate the same in C language
2.	Implementation of Lexical Analyzer using JLex, flex or other lexical analyser generating tools
3.	Generate YACC specification for a few syntactic categories. a. Program to recognize a valid arithmetic expression that uses operator +, - , * and /. b. Program to recognize a valid variable which starts with a letter followed by any number of letters or digits. c. Implementation of Calculator using LEX and YACC
4.	Implementation of LALR Parsing
5.	Convert the BNF rules into Yacc form and write code to generate Abstract Syntax Tree
6.	Implementation of Symbol Table
7.	Implement type checking
8.	Implement control flow analysis and Data flow Analysis
9.	Implement any one storage allocation strategies(Heap,Stack,Static)
10.	Construction of DAG
11.	Implement the back end of the compiler which takes the three address code and produces the 8086 assembly language instructions that can be assembled and run using a 8086 assembler.The target assembly instructions can be simple move, add, sub, jump. Also simple addressing modes are used.
12.	Implementation of Simple Code Optimization Techniques (Constant Folding., etc.)

Total Practical Hours 45

Course Outcome

CO1: Able to implement the different phases of compiler using tools.
CO2: Able to analyze the control flow and data flow of a typical program.
CO3: Able to generate an assembly language program equivalent to a source language program.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C / C++ / Java / Equivalent complier : 30 Nos.

(or)

Server with C / C++ compiler and Compiler writing tools supporting 30 terminals or more-LEX and YACC

TEXT BOOKS:

T1. Enterprise Cloud Computing by Gautam Shroff, Cambridge,2010
T2. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley - India, 2010 ,
ISBN:978-0-470-58987-8
T3. Getting Started with OwnCloud by Aditya Patawar , Packt Publishing Ltd, 2013
T4. www.openstack.org

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with PHP, HTML, JOSSO and own Cloud, Microsoft azure. 30 Nos.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS7201	CRYPTOGRAPHY AND NETWORK SECURITY	3	0	0	3

Course Objective

1. To know the methods of conventional encryption.
2. To understand the concepts of public key encryption and number theory
3. To understand authentication and Hash functions.
4. To know the network security tools and applications.
5. To understand the system level security used.

Unit	Description	Instructional Hours
I	**INTRODUCTION** The OSI Security Architecture-Security Attacks, Security Services -Security Mechanisms -A Model for Network Security -Classical Encryption Techniques: Symmetric Cipher Model -Substitution -Transposition Techniques -Basic Concepts in Number Theory and Finite Fields -Euclidean Algorithm -Modular Arithmetic -Polynomial Arithmetic	9
II	**BLOCK CIPHERS** Symmetric Ciphers Block Cipher Principles - Data Encryption Standard (DES) -DES Example -Strength of DES -Differential and Linear Cryptanalysis -Block Cipher Design Principles -Advanced Encryption Standard(AES) –Structure –Round Functions -Key Expansion -AES Example.	9
III	**ASYMMETRIC CIPHERS AND KEY MANAGEMENT** Asymmetric Ciphers & Key Management Prime Numbers -Fermat's and Euler's Theorems -Testing for Primality -Discrete Logarithms -Public-Key Cryptography and RSA -Diffie-Hellman Key Exchange -Key Management and Distribution -Symmetric Key Distribution Using Asymmetric Encryption -Distribution of Public Keys -X.509 Certificates -Public Key Infrastructure.	9
IV	**CRYPTOGRAPHIC DATA INTEGRITY ALGORITHMS** Cryptographic Data Integrity Algorithms Cryptographic Hash Functions -Applications -Two Simple Hash Functions -Requirements and Security Hash Functions based on Cipher Block Chaining -Secure Hash Algorithm (SHA) -SHA-3 –Message Authentication Codes -Requirements –Functions -Security of MACs -MACs based on Hash Functions: HMAC -Digital Signatures -Digital Signature Standard (DSS) - Kerberos.	9
V	**NETWORK & INTERNET SECURITY TRANSPORT LEVEL SECURITY** Network and Internet Security Transport Level Security -Web Security Issues - Secure Sockets Layer (SSL) -Transport Layer Security (TLS)-HTTPS -Secure Shell (SSH) -Electronic Mail Security -Pretty Good Privacy (PGP) -S/MIME -IP Security -Firewalls.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Able to design and conduct experiments to analyze and interpret data.
CO2: Able to use Cryptography in different fields of Engineering and Mathematics.
CO3: Able to analyze and select a suitable Cipher for an application.
CO4: Able to use the best solution for a threat
CO5: Able to analyze the system level security

TEXT BOOKS:

T1- William Stallings, "Cryptography and Network Security: Principles and Practice", Prentice Hall of India/Pearson Education, New Delhi, 2010
T2 - Atul Kahate, "Cryptography and Network Security", Tata McGraw Hill Publishing Company, New Delhi, 2007

REFERENCE BOOKS :

R1 - Behrouz Forouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", Tata McGraw Hill Publishing Company , New Delhi, 2010.
R2 - Roberta Bragg, Mark Rhodes Ousley, Keith Strassberg, "Network Security: The Complete Reference", McGraw Hill Publishing Company, Singapore, 2004.
R3 - Kaufman, Perlman and Speciner, "Network Security: Private Communication in a public world", Prentice Hall of India/ Pearson Education, New Delhi, 2004.
R4 - Charles P Pfleeger, "Security in computing", Pearson Education, New Delhi, 2003.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS7202	DISTRIBUTED AND CLOUD COMPUTING (CSE & IT)	3	0	0	3

Course Objective

1. To layout foundations of Distributed Systems.
2. To introduce the idea of middleware and related issues
3. To analyze the components of cloud computing and its business perspective.
4. To evaluate the various cloud development tools.
5. To collaborate with real time cloud services

Unit	Description	Instructional Hours
I	**INTRODUCTION** Characterization of Distributed systems - System Models -Inter-process –Communication -Remote Invocation-Indirect Communication-Distributed Object and Components -SOAP-based Web Services and Restful Web Services -Peer-to-Peer Systems	9
II	**CLOUD COMPUTING FUNDAMENTALS** Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics..Four Cloud Deployment Models Service providers- Google App Engine, Amazon EC2, Microsoft Azure, Sales force.	9
III	**VIRTUALIZATION FOR CLOUD** Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization – System Vm, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary translation, HLL VM - Hypervisors – Xen, KVM , VMWare, Virtual Box, Hyper-V.	9
IV	**SECURITY, STANDARDS, AND APPLICATIONS** Security in Clouds: Cloud security challenges – Software as a Service Security, Common Standards: The Open Cloud Consortium – The Distributed management Task Force – Standards for application Developers – Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud.	9
V	**PROGRAMMING MODEL** Introduction to Hadoop Framework – Map reduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job – Design of Hadoop file system, HDFS concepts, command line and java interface, dataflow of File read & File write.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Have knowledge about the state-of-the-art in distributed-systems architectures.
CO2: Ability to understand various service delivery models of a cloud computing architecture.
CO3:Analyze the performance, scalability, and availability of the underlying cloud technologies and software.
CO4: Identify security and privacy issues in cloud computing.
CO5: Ability to understand the ways in which the cloud can be programmed and deployed.

TEXT BOOKS:

1. **Rajkumar Buyya, James Broberg, Andrzej M. Goscinski,"**Cloud Computing: Principles and Paradigms" , John Wiley & Sons, 2010.
2. Distributed and Cloud Computing. Kal Hwang. Geoffeiy C.Fox. Jack J.Dongarra. Elsevier. 2012.

REFERENCE BOOKS

1. Cloud Computing: A Practical Approach. Anthony T.Velte. Toby J.VeFte, Robert Elsenpeter. Tata McGraw Hill. rp20ll.
2. Enterprise Cloud Computing Gautam Shroif, Cambridge University Press. 2010.
3. Cloud Computing: Implementation, Management and Security, John W. Rittinouse, James F Ransome. CRC Press, rp2012.
4. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud. George Reese, O'RedI SPD, rp2Oll.
5. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Ktriaraswamy, Shahed Latif, O'Redç SPD, rp2Oll.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS7203	MOBILE COMPUTING	3	0	0	3

Course Objective

1. Understand the basic concepts of mobile computing
2. Be familiar with the network protocol stack
3. Learn the basics of mobile telecommunication system
4. Be exposed to Ad-Hoc networks
5. Gain knowledge about different mobile platforms and application development

Unit	Description	Instructional Hours
I	**INTRODUCTION** Mobile Computing – Mobile Computing Vs wireless Networking – Mobile Computing Applications – Characteristics of Mobile computing – Structure of Mobile Computing Application. MAC Protocols –Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes.	9
II	**MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER** Overview of Mobile IP – Features of Mobile IP – Key Mechanism in Mobile IP – route Optimization – Overview of TCP/IP – Architecture of TCP/IP – Adaptation of TCP Window – Improvement in TCP Performance.	9
III	**MOBILE TELECOMMUNICATION SYSTEM** In Global System for Mobile Communication (GSM) – General Packet Radio Service (GPRS) – Universal Mobile Telecommunication System (UMTS).	9
IV	**MOBILE AD-HOC NETWORKS** Ad-Hoc Basic Concepts – Characteristics – Applications – Design Issues – Routing – Essential of Traditional Routing Protocols –Popular Routing Protocols – Vehicular Ad Hoc networks (VANET) –MANET Vs VANET – Security.	9
V	**MOBILE PLATFORMS AND APPLICATIONS** Mobile Device Operating Systems – Special Constrains & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Explain the basics of mobile telecommunication system
CO2: Choose the required functionality at each layer for given application
CO3: Identify solution for each functionality at each layer
CO4: Use simulator tools and design Ad hoc networks.
CO5: Develop a mobile application

TEXT BOOKS:

T1 - Prasant Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing", PHI Learning Pvt. Ltd, New Delhi – 2012.

REFERENCE BOOKS:

R1 - Jochen H. Schller, "Mobile Communications", Second Edition, Pearson Education, New Delhi, 2007.
R2 - Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
R3 - Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 2003.
R4- William.C.Y.Lee,"Mobile Cellular Telecommunications-Analog and Digital Systems", Second Edition,Tata Mc Graw Hill Edition ,2006.
R5- C.K.Toh, "AdHoc Mobile Wireless Networks", First Edition, Pearson Education, 2002.
R6 - Android Developers : http://developer.android.com/index.html
R7 - Apple Developer : https://developer.apple.com/
R8 - Windows Phone Dev Center : http://developer.windowsphone.com
R9 - BlackBerry Developer : http://developer.blackberry.com/

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS7001	SECURITY LABORATORY	0	0	4	2

Course Objective

1. Be exposed to the different cipher techniques
2. Learn to implement the algorithms DES, RSA, MD5, SHA-1
3. Learn to use network security tools like GnuPG, KF sensor, Net Strumbler

Expt. No.	Description of the Experiments	
1.	Implement the following SUBSTITUTION & TRANSPOSITION TECHNIQUES concepts: a. Caesar Cipher b. Playfair Cipher c. Hill Cipher d. Vigenere Cipher e. Rail fence – row & Column Transformation	9
2.	Implement the following algorithms a. DES b. RSA Algorithm c. Diffiee-Hellman d. MD5 e. SHA-1.	12
3.	Implement the SIGNATURE SCHEME - Digital Signature Standard	3
4.	Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG).	3
5.	Setup a honey pot and monitor the honeypot on network (KF Sensor)	6
6.	Installation of rootkits and study about the variety of options	3
7.	Perform wireless audit on an access point or a router and decrypt WEP and WPA.(Net Stumbler)	6
8.	Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w)	3
	Total Practical Hours	**45**

Course Outcome

CO1: Implement the cipher techniques

CO2: Develop the various security algorithms

CO3: Use different open source tools for network security and analysis

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE:

C / C++ / Java or equivalent compiler
GnuPG, KF Sensor or Equivalent, Snort, Net Stumbler or Equivalent

HARDWARE:

Standalone desktops - 30 Nos.
(or)
Server supporting 30 terminals or more.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS7002	CLOUD COMPUTING LABORATORY (CSE & IT)	0	0	4	2

Course Objective

1. To implement Basics, techniques and tools for Cloud Computing
2. Be familiar with developing web services.
3. To know the concepts of Cloud Infrastructure and services.
4. Learn to run virtual machines of different configuration with modern cloud tools.
5. Understand the concept of Cloud security.

Expt. No.	Description of the Experiments
1.	Implement a method to run the virtual machine of different configuration. Check how many virtual machines can be utilized at particular time.
2.	Create procedure to attach virtual block to the virtual machine and check whether it holds the data even after the release of the virtual machine.
3.	Install a C compiler in the virtual machine and execute a sample programs.
4.	Show the virtual machine migration based on the certain condition from one node to the other.
5.	Find procedure to install storage controller and interact with it.
6.	Find procedure to set up the one node Hadoop cluster.
7.	Mount the one node Hadoop cluster using FUSE.
8.	Write a program to use the API's of Hadoop to interact with it.
9.	Write a word count program to demonstrate the use of Map and Reduce tasks
	Total Practical Hours **45**

Course Outcome

CO1: Understand the Basic Requirements of cloud
CO2: Use the cloud infrastructure tool kits
CO3: Design and implement applications on the Cloud Infrastructure
CO4: Design and implement applications on the cloud security.
CO5: Implement the Concept of Cloud Services

ELECTIVE-I

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
BE	16CS5301	ADVANCED JAVA PROGRAMMING	3	0	0	3

Course Objective

1. To learn advanced java programming concepts like interface, threads, swings etc.
2. To develop network programs in java
3. To understand concepts needed for distributed and multi-tier applications
4. To understand issues in enterprise application development
5. To demonstrate approaches for performance and effective coding

Unit	Description	Instructional hours
I	**JAVA FUNDAMENTALS** Object oriented programming concepts - Extending classes and inheritance – packages - user interfaces - graphic programming - exception handling and debugging - array and string – multithreading - collections - Java I/O streaming-filter and pipe streams - byte code interpretation - threading - swing - applets	9
II	**NETWORK PROGRAMMING IN JAVA** Sockets - secure sockets - custom sockets - UDP datagrams - multicast sockets - URL classes - Reading data from the server - writing data - configuring the connection - Reading the header - sending Email - telnet application - Java messaging services.	9
III	**APPLICATIONS IN DISTRIBUTED ENVIRONMENT** Remote method invocation - Activation models - RMI custom sockets - Object serialization - RMI- IIop implementation -CORBA - IDL technologies - Naming services - CORBA programming model - JAR file creation - Case studies.	9
IV	**MULTI-TIER APPLICATION DEVELOPMENT** Web application Basics - Architectures and challenges of Web application - Introduction to servlet - servlet life cycle - Developing and deploying servlets - Exploring deployment - descriptor(web.xml),handling request and response - Intoduction to JDBC-JDBC drivers and architectures - CURD operation using JDBC-connecting to non conventional database - Applet to Applet communication-applet to servlet communication - multimedia streaming applications - Java media framework.	9
V	**ENTERPRISE APPLICATIONS** Server side component architecture - Introduction to J2EE - session beans - entity beans - persistent entity beans - case studies.	9
	Total Instructional Hours	**45**

Course Outcome

CO1. To cover topics in various java technologies.
CO2. Use the methods of the Applet and Component classes required for a basic applet
CO3. To make the students to develop distributed business applications and multitier applications
CO4. To develop web pages using advanced server-side programming through servlets and java server pages.
CO5. Develop program using javax.servlet package

TEXT BOOKS:

T1. Elliotte Rusty Harold,"Java Network programming",o'Reilly publishers,2000(unit II)
T2. Ed Roman,"Mastering Enterprise Java Beans",John Wiley & sons Inc.,1999.(unit III and unit V)
T3. Hortsmann & Cornell,"core Java 2 Advanced Feauture,Vol II",pearson Education,2002.(Unit I and Unit IV)

REFERENCE BOOKS:

R1. Http://Java.Sun.Com
R2. Patrick Naughton,"Complete Reference: Java2",Tata McGraw-Hill,2003

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
BE	16CS5302	VISUALIZATION TECHNIQUES	3	0	0	3

Course Objective

1. To learn about different Visualization Techniques
2. To study the Interaction techniques in information visualization fields
3. To study about Multi dimension visualization Techniques
4. To understand various abstraction mechanisms
5. To create interactive visual interfaces

Unit	Description	Instructional hours
I	**FOUNDATION OF DATA VISUALIZATION** Introduction to visualization, Visualization stages, Experimental semiotics on perception, Gibson's affordance theory, Limitation of Gibson's affordance theory, Model of perceptual processing, Cost and benefits of visualization, Type of data, Abstraction.	9
II	**COMPUTER VISUALIZATION** Computer Visualization and Non-Computer Visualization, Exploring the complex information space, Fisheye view applications, Comprehensible Fisheye Views, Fisheye views for 3D data, Non linear magnification, Comparing visualization of information space, Abstraction in computer graphics, Abstraction in user interface.	9
III	**MULTI DIMENSIONAL VISUALIZATION** Single dimension, Two dimension, Three dimension, Trees, Web works, Data Mapping, Document Visualization, Work space.	9
IV	**TEXTUAL METHOD OF ABSTRACTION** From graphics to full text, Figure captions in visual interfaces, Interactive 3D illustration with image and text, Consistency of rendering, Images and its textual labels, Architecture, Zoom Technique for illustration purpose, Interactive handling of images and text.	9
V	**ABSTRACTION IN TIME AND INTERACTIVE SYSTEMS** Animating non Photo realistic Computer Graphics, Interaction Facilities and High Level Support for Animation Design, Zoom Navigation in User Interfaces, Interactive Medical Illustrations, Rendering Gestural Expressions, Animating design for Simulation, Tactile Maps for Blind People – Synthetic holography, Abstraction Versus Realism, Integrating Spatial and Non Spatial Data..	9
	Total Instructional Hours	**45**

Course Outcome

CO1. Ability to understand the data visualization concepts
CO2. Ability to understand modern visualization techniques
CO3. Ability to understand various interaction techniques
CO4. Ability to understand various textual methods of abstraction
CO5. Ability to create interactive visual interface applications

TEXT BOOKS:

T1. Colin Ware "Information Visualization Perception for Design", 3rd edition, Morgan Kaufman 2012. (UNIT 1)
T2. Stuart.K.Card, Jock.D.Mackinlay and Ben Shneiderman, "Readings in Information Visualization Using Vision to think", Morgan Kaufmann Publishers, 1999. (UNIT 3)
T3. Thomas Strothotte, "Computer Visualization–Graphics Abstraction and Interactivity", Springer Verlag Berlin Heiderberg 1998. (UNIT 2, 4, 5)

REFERENCE BOOKS:

R1. Chaomei Chan, "Information Visualization", Beyond the horizon, 2nd edition, Springer Verlag, 2004.
R2. Pauline Wills, "Visualisation: A Beginner's Guide", Hodder and Stoughlon, 1999.
R3. Benedikt. M, "Cyberspace: Firot Steps", MIT Press, 1991.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS5303	SERVICE ORIENTED ARCHITECTURE	3	0	0	3

Course Objective

1. To learn service oriented analysis techniques
2. To learn technology underlying the service design
3. To learn advanced concepts such as service composition, orchestration and Choreography
4. To know about various Web Service specification standards
5. To learn about SOA Platforms

Unit	Description	Instructional Hours
I	**INTRODUCTION** 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	9
II	**SERVICE ORIENTED ARCHITECTURE IN WEB SERVICES** Web services, Service descriptions, Messaging with SOAP, Message exchange Pattern, Coordination, Atomic Transactions, Business activities, Orchestration , Choreography, Service layer abstraction, Application Service Layer, Business Service Layer, Orchestration Service Layer	9
III	**BUILDING SOA** 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.	9
IV	**SOA PLATFORMS** 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).	9
V	**SOA DESIGN** Web Service, BPEL- process, elements, functions, Web Service, Coordination, overview, elements, web service business activity & atomic transaction coordination type , Business process design Web Service , Choreography, Web Service, Policy-elements, Web Service Security, XML, Signature element	9
	Total Instructional Hours	45

Course Outcome

CO1. Ability to understand service oriented architecture
CO2. Ability to build service oriented architecture applications
CO3. Ability to understand various service oriented architecture techniques
CO4. Ability to understand service oriented architecture platforms
CO5. Ability to understand service oriented architecture design

TEXT BOOKS:

T1. Thomas Erl, "Service-Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2009.
T2. Thomas Erl, "SOA Principles of Service Design" (The Prentice Hall Service- Oriented Computing Series from Thomas Erl), 2005.

REFERENCE BOOKS:

R1. Newcomer, Lomow, "Understanding SOA with Web Services", Pearson Education, 2005.
R2. Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services, An Architect's Guide", Pearson Education, 2005.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS5304	INFORMATION STORAGE MANAGEMENT	3	0	0	3

Course Objective

1. Understand about the storage system
2. Learn the storage networking technologies
3. Describe the core elements in a data center.
4. Learn the Cloud computing characteristics and benefits
5. Understand RAID and its various levels for data backup.

Unit	Description	Instructional Hours
I	**STORAGE SYSTEM** Introduction to information storage, Virtualization and cloud computing, Key data center elements, Compute, application, and storage virtualization, Disk dive & flash drive components and performance, RAID, Intelligent storage system and storage provisioning (including virtual provisioning)	9
II	**STORAGE NETWORKING TECHNOLOGIES AND VIRTUALIZATION** Fibre Channel SAN components, FC protocol and operations, Block level storage virtualization, iSCL and FCIP as an IP-SAN solutions, Converged networking option FcoE, Network Attached Storage (NAS) components, protocol and operations, File level storage virtualization, Object based storage and unified storage platform.	9
III	**BACKUP, ARCHIVE AND REPLICATION** Business continuity terminologies, planning and solutions, Clustering and multipathing to avoid single points of failure, Backup and recovery methods, targets and topologies, data deduplication and backup in virtualized environment, fixed content and data archive, Local replication in classic and virtual environments, Remote replication in classic and virtual environments, Three-site remote replication and continuous data protection.	9
IV	**CLOUD COMPUTING CHARACTERISTICS AND BENEFITS** Cloud Enabling Technologies - Characteristics of Cloud Computing- Benefits of Cloud Computing-Cloud Service Models Cloud deployment models- Cloud Computing Infrastructure-Cloud Challenges, Cloud migration considerations	9
V	**SECURING AND MANAGING STORAGE INFRASTRUCTURE** Security threats, and countermeasures in various domains, Security solutions for FC-SAN, IP-SAN and NAS environments, Security in virtualized and cloud environments, Monitoring and managing various information infrastructure components in classic and virtual environments, Information lifecycle Management (ILM) and storage tiering.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1.Explain physical and logical components of a storage infrastructure including storage subsystems, RAID and intelligent storage systems.
CO2. Describe storage networking technologies such as FC-SAN, IP-SAN, FCoE, NAS and object based, and unified storage.
CO3. Illustrate and articulate business continuity solutions, backup and replications, along with archive for managing fixed content.
CO4. Explain key characteristics, services, deployment models, and infrastructure components for a cloud computing.
CO5. Implement the concept of security storage infrastructure management.

REFERENCE BOOKS:

R1: Information Storage and Management: Storing, Managing and Protecting Digital Information in classic, Virtualized and Cloud Environments, 2nd Edition, EMC Educations Services, Wiley,May 2012.

R2:Information Storage and Management: Storing, Managing, and Protecting Digital Information,EMC Education Services, Wiley, January 2010

R3: Ulf Troppens, Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, Nils Haustein ,"Storage Networks Explained: Basics and Application of Fibre Channel SAN, NAS, iSCSI, InfiniBand and FCoE, 2nd Edition, Wiley, July 2009

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
BE	16CS5305	TCP/IP PRINCIPLES AND ARCHITECTURES	3	0	0	3

Course Objective

1. To learn the principle s of TCP / IP and its Architecture.
2. To understand the basic concepts of TCP/IP Architecture
3. To enhance the knowledge to UDP and its applications
4. To provide knowledge on TCP features and SMTP
5. To understand the concepts on Transport layer rel

Unit	Description	Instructional hours
I	**INTRODUCTION** Intermediate communication entities- Layering network addresses-DNS-Client server model- Port numbers- Standardization process-RFC's-Standard simple services-Application programming interfaces-Ethernet &IEEE 802 – encapsulation-SLIP-PPP-loop back interface-MTU-path MTU-ARP cache – Packet format – proxy ARP & Gratitions ARP –ARP command – RARP- Structure TCP/IP s/w in operating system.	9
II	**NETWORK LAYER AND APPLICATION** Introduction- IP header- IP routing - Subnet addressing- Subnet mask- Special case IP addresses – Examples- Ifconfig – Netstat- routing principles - ICMP host and Network unreachable errors - ICMP redirect errors – ICPM router discovery messages- Dynamic routing - UNIX routing daemons- routing information protocol (RIP)-OSPF-CIDR – Case study: Voice over IP for two way Communication.	9
III	**UDP AND APPLICATIONS** Introduction- UDP header- UDP checksum- examples-IP fragmentation - ICMP unreachable errors – Path MTU discovery- Interaction between UDP and ARP-UDP datagram size- ICMP source quench error- Broad casting and Multi casting - IGMP-NFS- -TFTP-BOOTP	9
IV	**TCP** Introduction- TCP services- TCP header – Connection establishment and termination – Maximum size – TCP half close – TCP state transition diagram – Reset segments-Simultaneous open and close – TCP options – Interactive input – Delayed acknowledgement – Nagle algorithm – Window size advertisement- Normal data flow – Sliding window – Window size - PUSH flag – Slow start– Bulk data throughput – Urgent mode	9
V	**TRANSPORT LAYER RELIABILITY AND APPLICATION** CP/IP time out – Retransmission – Roundtrip time measurement – Congestion avoidance algorithms – Fast retransmit and fast recover algorithm – Repacaketization - ICMP errors- TCP persistent – TCP features and performance – Telnet and rhogin - SMTP – TCP dump	9
	TOTAL INSTRUCTIONAL HOURS	45

Course Outcome

CO1. Able to learn the principle s of TCP / IP and its Architecture.
CO2. Able to understand the basic concepts of TCP/IP Architecture
CO3. Able to understand UDP and its applications.
CO4. Able to understand the sliding window and delayed acknowledgement methodologies.
CO5. Able to enhance the knowledge on broadcasting and multi casting in UDP.

TEXT BOOKS:

T1. W. Richard Stevens, "TCP/IP Illustrated,The Protocol-Volume I", Addison-Wesley Pub Co,1stEdition,1994
T2. Dougles E.Comer, "Internetworking with TCP/IP–Principles, Protocols & Architecture", Pearson education, 4thEdition,2000

REFERENCE BOOKS:

R1. Behrouz A. Forouzam, " TCP/IP Protocol Suite ", Tata McGraw Hill, 2000
R2. Michael Santifaller, " TCP/IP – ONC/NFS, Internetworking in UNIX Environment", Addison Wesley Professional, 2nd Edition, 1994.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
BE	16CS5306	SYSTEM SOFTWARE	3	0	0	3

Course Objective

1. To understand the relationship between system software and machine architecture.
2. To know the design and implementation of assemblers
3. To know the design and implementation of loaders and linkers
4. To have an understanding of compilers, interpreters, and macro processors.
5. To have an understanding of system software tools.

UNIT	DESCRIPTION	TOTAL INSTRUCTIONAL HOURS
I	**INTRODUCTION** Language processors, Language processing activities–fundamentals of language processing– System software and machine architecture – The Simplified Instructional Computer (SIC) - Machine architecture - Data and instruction formats - addressing modes - instruction sets	8
II	**ASSEMBLERS** Basic assembler functions - A simple SIC assembler – Assembler algorithm and data structures - Machine dependent assembler features - Instruction formats and addressing modes – Program relocation - Machine independent assembler features - Literals – Symbol-defining statements – Expressions - One pass assemblers and Multi pass assemblers - Implementation example - MASM assembler.	10
III	**LOADERS AND LINKERS** Basic loader functions - Design of an Absolute Loader – A Simple Bootstrap Loader - Machine dependent loader features - Relocation – Program Linking – Algorithm and Data Structures for Linking Loader - Machine-independent loader features - Automatic Library Search – Loader Options - Loader design options - Linkage Editors – Dynamic Linking – Bootstrap Loaders - Implementation example - MSDOS linker.	9
IV	**COMPILERS AND INTERPRETERS - MACROS** Compilers and Interpreters: Aspects of compilation–memory allocation–compilation of expressions-compilation of control structure code optimization–interpreters. Macro definition and Call macro expression–nested macro calls–advanced macro facilities–design of macro processors.	9
V	**SYSTEM SOFTWARE TOOLS** Text editors - Overview of the Editing Process - User Interface – Editor Structure. - Interactive debugging systems - Debugging functions and capabilities – Relationship with other parts of the system – User-Interface Criteria.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1. Understands the language processing activities
CO2. Understands How to implement the assemblers
CO3. Understands the concept of loaders and linkers
CO4.Understands how to implement compilers, interpreters and macros
CO5.Understands the system software tools

TEXT BOOKS:

T1..D.M. Dhamdhere–System programming & operating system, Tat McGraw Hill Publishing Co., 1997.Reference Books
T2. J.J.Donovan, System programming, Tata McGraw Hill , 1996.
T3. Leland L. Beck, "System Software – An Introduction to Systems Programming", 3rd Edition, Pearson Education Asia, 2007.

REFERENCE BOOKS:

R1. D. M. Dhamdhere, "Systems Programming and Operating Systems", Second Revised Edition, Tata McGraw-Hill, 1999.
R2.John J. Donovan "Systems Programming", Tata McGraw-Hill Edition, 2001
R3. John R. Levine, Linkers & Loaders – Harcourt India Pvt. Ltd., Morgan Kaufmann Publishers, 2000.

ELECTIVE- II

PROGRAM	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E	16CS6301	ENTERPRISE COMPUTING	3	0	0	3

Course Objective

1. Understand the concepts of enterprise computing.
2. Learn the incepting enterprise Applications
3. Understand how to design an enterprise architecture.
4. Construct and roll out the designed architecture as application.
5. Testing and rolling out on the enterprise Application.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Enterprise Applications-Software Engineering Methodologies-Life Cycle of Raising Enterprise Applications-Three Key Determinants of Successful Enterprise Applications	9
II	**INCEPTING ENTERPRISE APPLICATIONS** Enterprise Analysis-Business Modeling-EM Bank-A Case Study-Requirement Elicitation and Analysis-Actors and Use Cases-User Prototypes-Non-Functional Requirements-Requirements Validation	9
III	**ARCHITECTING AND DESIGNING ENTERPRISE APPLICATIONS** Architecture, Views and Viewpoints-Enterprise Application-An Enterprise Architectur Perspective-Logical Architecture-Technical Architecture and Design -Data Architectur and Design-Infrastructure Architecture and Design	9
IV	**CONSTRUCTING ENTERPRISE APPLICATIONS** Construction Readiness-Introduction to Software Construction Map-Constructing the Solution Layers-Code Review-Static Code Analysis-Build Process and Unit Testing.	9
V	**TESTING AND ROLLING OUT ENTERPRISE APPLICATIONS** Testing Enterprise Applications-Enterprise Application Environments-Integration Testing-System Testing-User Acceptance Testing	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Identify information systems used in the functional units of an enterprise.
CO2.Analyze the integrated information systems used throughout an enterprise.
CO3.Create and manage large-scale computing systems for an organization.
CO4.Demonstrate skills to understand business environment.
CO5.Analyze the applications of testing on the enterprise environment..

REFERENCE BOOKS:

R1. Anubhav Pradhan, B.Satheesha Nanjappa, Senthil Nallasamy and E.Veerakumar, "Raising Enterprise Applications : A Software Engineering Perspective", Wiley India Pvt Ltd, 2010
R2. Paul J Perrone, Venkata S.R. Krishna R and Chayanti, "Building Java Enterprise Systems with J2EE", Techmedia, New Delhi, 2000.
R3. Tom Valesky -"Enterprise Java Beans"-Addison Wesley Longman Inc. New Delhi, 2000.
R4. Ed Roman-"Mastering EJB"-John Wiley & Sons, New Delhi, 2001.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
BE	16CS6302	SOCIAL NETWORK ANALYSIS	3	0	0	3

Course Objective

1. To understand the components of web based social networks
2. To model and visualize the social networks in various aspects
3. To mine the users community in social networks.
4. To understand the evolution of social networks through various models
5. To mine the opinions of the users in social networks

Unit	Description	Instructional Hours
I	**INTRODUCTION** Introduction to Web - Limitations of current Web – Development of Semantic Web – Emergence of the Social Web – Statistical Properties of Social Networks -Network analysis - Development of Social Network Analysis - Key concepts and measures in network analysis - Discussion networks - Blogs and online communities - Web-based networks	9
II	**MODELING AND VISUALIZATION** Visualizing Online Social Networks - A Taxonomy of Visualizations - Graph Representation - Centrality- Clustering - Node-Edge Diagrams - Visualizing Social Networks with Matrix-Based Representations- Node-Link Diagrams - Hybrid Representations - Modelling and aggregating social network data – Random Walks and their Applications –Use of Hadoop and Map Reduce - Ontological representation of social individuals and relationships.	9
III	**MINING COMMUNITIES** Aggregating and reasoning with social network data, Advanced Representations – Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Evaluating Communities – Core Methods for Community Detection & Mining - Applications of Community Mining Algorithms - Node Classification in Social Networks.	9
IV	**EVOLUTION** Evolution in Social Networks – Framework - Tracing Smoothly Evolving Communities - Models and Algorithms for Social Influence Analysis - Influence Related Statistics - Social Similarity and Influence - Influence Maximization in Viral Marketing - Algorithms and Systems for Expert Location in Social Networks - Expert Location without Graph Constraints - with Score Propagation – Expert Team Formation - Link Prediction in Social Networks - Feature based Link Prediction – Bayesian Probabilistic Models	9
V	**TEXT AND OPINION MINING** Text Mining in Social Networks -Opinion extraction – Sentiment classification and clustering - Temporal sentiment analysis - Irony detection in opinion mining - Wish analysis - Product review mining – Review Classification – Tracking sentiments towards topics over time.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Work on the internals components of social networks
CO2 : Model and visualize social networks
CO3 : Mine the behavior of the users in social networks
CO4 : Predict the possible next outcome of social networks
CO5 : Mine the opinions of the user social networks.

TEXT BOOKS:

T1 - Charu C. Aggarwal, "Social Network Data Analytics", Springer; 2011
T2 - Peter Mika, "Social Networks and the Semantic Web", Springer, 1st edition, 2007.
T3 - Borko Furht, "Handbook of Social Network Technologies and Applications", Springer, 1st edition, 2010.

REFERENCE BOOKS :

R1 - Guandong Xu , Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", Springer, 1st edition, 2011.
R2 - Giles, Mark Smith, John Yen, "Advances in Social Network Mining and Analysis", Springer, 2010.
R3 - . Ajith Abraham, Aboul Ella Hassanien, Václav Snášel, "Computational Social Network Analysis: Trends, Tools and Research Advances", Springer, 2009.
R4 - . Toby Segaran, "Programming Collective Intelligence", O'Reilly, 2012

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
BE	16CS6303	EMBEDDED SYSTEMS	3	0	0	3

Course Objective

1. To be familiar with 8051 microcontoller.
2. Understand the basic Memory and I/O managements.
3. Learn about the Process and OS
4. Learn the embedded software.
5. Design and develop embedded systems

Unit	Description	Total instructional hours
I	**EMEDDED COMPUTING**Challenges of Embedded Systems - Embedded system design process. Embedded processors – 8051 Microcontroller, ARM processor - Architecture, Instruction sets and programming.	9
II	**MEMORY AND I/O MANAGEMENT** Programming Input and Output - Memory system mechanisms - Memory and I/O devices and interfacing- Interrupts handling.	9
III	**PROCESSES AND OPERATING SYSTEMS** Multiple tasks and processes - Context switching - Scheduling policies - Interprocess communication mechanisms - Performance issues.	9
IV	**EMBEDDED SOFTWARE** Programming embedded systems in assembly and C - Meeting real time constraints - Multi-state systems and function sequences. Embedded software development tools - Emulators and debuggers.	9
V	**EMBEDDED SYSTEM DEVELOPMENT** Design issues and techniques - Case studies - Complete design of example embedded systems.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Explore the concepts of embedded computing with 8051 microcontroller.
CO2: Illustrate the memory and I/O operations.
CO3: Explain the processes and operating system concepts.
CO4: Elucidate the embedded software concepts.
CO5: Develop embedded systems using case studies. to develop web-based multimedia applications.

REFERENCE BOOKS:

1. Wayne Wolf, Computers as Components: Principles of Embedded Computer System Design,Elsevier, 2008.
2. Michael J. Pont, Embedded C, Pearson Education, 2007.
3. Steve Heath, Embedded System Design, Elsevier, 2005.
4. Muhammed Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems" , Pearson Education, 2nd edition, 2007.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
BE	16CS6304	TOTAL QUALITY MANAGEMENT	3	0	0	3

Course Objective

1. Understand the basic concepts of Total Quality Management
2. Study principles and philosophies of quality management.
3. Understand the different quality systems.
4. Learn the tools and techniques for management.
5. Understand about the Quality systems and its implementation

UNIT	DESCRIPTION	TOTAL INSTRUCTIONAL HOURS
I	**INTRODUCTION TO QUALITY MANAGEMENT** Definitions - TQM framework, benefits, awareness and obstacles. Quality vision, mission and policy statements. Customer Focus -customer perception of quality, Translating needs into requirements, customer retention. Dimensions of product and service quality.	9
II	**PRINCIPLES AND PHILOSOPHIES OF QUALITY MANAGEMENT** Overview of the contributions of Deming, Juran Crosby, Masaaki Imai, Feigenbaum, Ishikawa, Taguchi techniques - introduction, loss function, parameter and tolerance design, signal to noise ratio. Concepts of Quality circle, Japanese 5S principles.	9
III	**STATISTICAL PROCESS CONTROL AND PROCESS CAPABILITY** Meaning and significance of statistical process control (SPC) -construction of control charts for variables and attributed. Process capability - meaning, significance and measurement -Six sigma concepts of process capability. Reliability concepts - definitions, reliability in series and parallel, and product life characteristics curve. Total productive maintenance (TMP)	9
IV	**TOOLS AND TECHNIQUES FOR QUALITY MANAGEMENT** Quality functions development (QFD) -Benefits, Voice of customer, information organization, House of quality (HOQ), building a HOQ, QFD process. Failure mode effect analysis (FMEA) - requirements of reliability, failure rate, FMEA stages, design, process and documentation. Seven old (statistical) tools. Seven new management tools.	9
V	**QUALITY SYSTEMS ORGANIZING AND IMPLEMENTATION** Introduction to IS/ISO 9004:2000 - quality management systems - guidelines for performance improvements. Quality Audits. TQM culture, Leadership - quality council, employee involvement, motivation, empowerment, recognition and reward	9
	TOTAL INSTRUCTIONAL HOURS	45

Course Outcome

CO1: Explore the TQM framework and quality statements.
CO2: Describe the philosophy and principles of Total Quality Management.
CO3 Interpret Statistical Process Control And Process Capability.
CO4: Implement the tools and techniques to enhance Management process.
CO5: Understand the Quality systems and implementation.

REFERENCE BOOKS:

1. Dale H. Besterfiled, et al, Total Quality Management, Pearson Education Asia, Third Edition, Indian Reprint (2011).
2. James R. Evans and William M. Lindsay, The Management and Control of Quality, 8th Edition, South-Western (Thomson Learning), 2011.
3. Oakland, J.S. TQM Text with Cases, Butterworth Heinemann Ltd., Oxford, 3rd Edition, 2003.
4. Suganthi,L and Anand Samuel, Total Quality Management, Prentice Hall (India) Pvt. Ltd.,2006
5. Janakiraman, B and Gopal, R.K, Total Quality Management Text and Cases, Prentice Hall (India) Pvt. Ltd., 2006.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
BE	16CS6305	NETWORK AND ROUTING PROTOCOLS	3	0	0	3

Course Objective

1. Learn the basics of networks.
2. Understand the Ethernet Technologies.
3. Understand about subnetting
4. Learn the Routing Protocols.
5. Learn about IPv4 ACLs.

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**NETWORKING FUNDAMENTALS** Exploring the Network: Globally Connected-LANs, WANs, and the Internet-The Network as a Platform- The Changing Network Environment-Configuring a Network Operating System: IOS Bootcamp-Getting Basic Addressing Schemes -Network Protocols and Communications: Rules of Communication-Network Protocols and Standards-Moving Data in the Network-Network Access.	9
II	**TCP/IP LAYER** Ethernet- Network Layer-Transport Layer: Role of the Transport Layer- Conversation Multiplexing- Transport Layer Reliability - Introducing TCP and UDP- IP Addressing: IPv4 Network Addresses-IPv6 Network Addresses- Connectivity Verification.	9
III	**SUBNETTING** Subnetting IP Networks: Subnetting an IPv4 Network-Addressing Schemes-Design Considerations for IPv6-Application Layer: Application Layer Protocols-Well-Known Application Layer Protocols and Service-The Message Heard Around the World-Introduction to Switched Networks.	9
IV	**VLAN AND ROUTING** VLANs-Routing Concepts-Inter-VLAN Routing: Inter-VLAN Routing Configuration-Troubleshooting Inter-VLAN Routing-Layer 3 Switching-Static Routing: Static Routing Implementation-Configure Static and Default Routes-Review of CIDR and VLSM-Configure Summary and Floating Static Routes- Troubleshoot Static and Default Route Issues.	9
V	**ROUTING PROTOCOLS AND ACL** Routing Dynamically-Single-Area OSP: Characteristics of OSPF-Configuring Single-area OSPFv2- Configure Single-area OSPFv3-F-Access Control Lists: IP ACL Operation-Standard IPv4 ACLs Extended IPv4 ACLSs-Contextual Unit: Debug with ACLs-Troubleshoot ACLs-Contextual Unit- IPv6 ACLs-DHCP: Dynamic Host Configuration Protocol v4-Dynamic Host Configuration Protocol v6-- Network Address Translation for IPv4: NAT Operation-Configuring NAT-Troubleshooting NAT.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Explain the basics of networks and cable media.
CO2: Demonstrate the TCP/IP layer.
CO3: Describe the subnetting IP Networks.
CO4: Troubleshoot VLAN and trunk configurations in a switched network.
CO5: Configure standard IPv4 ACLs to filter traffic according to networking requirements.

REFERENCE BOOKS:

1. Todd Lammle, CCNA Routing and Switching Study Guide, Wiley India Pvt Ltd 2013.
2. Todd Lammle, CCNA Cisco Certified Network Associate Study Guide, Wiley India Pvt Ltd, 7th Edition, 2011.
3. Wendell Odom, Cisco CCNA Routing and Switching 200-120 Official Cert Guide Library, Academic Edition, Cisco Systems, 2013.
4. Scott Empson, CCNA Routing and Switching Portable Command Guide, 3rd Edition, Cisco Press, 2013.

5.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
BE	16CS6306	SIGNALS AND SYSTEMS	3	0	0	3

Course Objective

1. To understand the basic properties of signal and systems and the various methods of classification.
2. To learn Laplace Transform and Fourier transform and their properties.
3. To know Z transform and DTFT and their properties.
4. To characterize LTI systems in the Time domain and various Transform domains.
5. To know about Discrete Fourier and Z transform.

Unit	Description	Instructional Hours
I	**CLASSIFICATION OF SIGNALS AND SYSTEMS** Continuous time signals (CT signals) - Discrete time signals (DT signals) - Step, Ramp, Pulse, Impulse, Sinusoidal, Exponential, Classification of CT and DT signals - Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals -CT systems and DT systems - Classification of systems – Static & Dynamic, Linear & Nonlinear, Time-variant & Time-invariant, Causal & Noncausal, Stable & Unstable.	9
II	**ANALYSIS OF CONTINUOUS TIME SIGNALS** Fourier series analysis - spectrum of Continuous Time (CT) signals - Fourier and Laplace Transforms in CT Signal Analysis – Properties.	9
III	**LINEAR TIME INVARIANT-CONTINUOUS TIME SYSTEMS** Differential Equation - Block diagram representation - impulse response, convolution integrals – Fourier and Laplace transforms in Analysis of CT systems.	9
IV	**ANALYSIS OF DISCRETE TIME SIGNALS** Baseband Sampling – DTFT – Properties of DTFT - Z Transform – Properties of Z Transform.	9
V	**LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS** Difference Equations - Block diagram representation – Impulse response - Convolution sum - Discrete Fourier and Z Transform Analysis of Recursive & Non - Recursive systems.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Analyze the properties of signals and systems.
CO2:Apply Laplace transform, Fourier transform, Z transform and DTFT in signal analysis.
CO3:Analyze continuous time LTI systems using Fourier and Laplace Transforms.
CO4:Analyze discrete time LTI systems using Z transform and DTFT.
CO5: Apply the fourier and Z transforms of recursive & Non recursive systems.

TEXT BOOKS:

T1 - Allan V.Oppenheim, S.Wilsky and S.H.Nawab, “Signals and Systems”, Pearson, 2007.

REFERENCE BOOKS:

R1- B. P. Lathi, “Principles of Linear Systems and Signals”, Second Edition, Oxford, 2009.
R2- R.E.Zeimer, W.H.Tranter and R.D.Fannin, “Signals & Systems - Continuous and Discrete”, Pearson, 2007.
R3- John Alan Stuller, “An Introduction to Signals and Systems”, Thomson, 2007.
R4- M.J.Roberts, “Signals & Systems Analysis using Transform Methods & MATLAB”, Tata McGraw Hill, 2007.

ELECTIVE – III

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
BE	16CS7301	C# AND .NET PROGRAMMING	3	0	0	3

Course Objective

1. Basics of C# and .NET
2. C# language constructs and programming
3. Advanced programming in C#
4. Fundamental window programming
5. Build web based applications

Unit	Description	Instructional Hours
I	**INTRODUCTION** Understanding .NET framework – understanding the .NET runtime environment – Introduction to C# - Examining basic C# components – writing and compiling a simple C# program.	7
II	**C# & OOP** C# data types – variables – operators – statements – Input/output – control flow – methods – debugging and error handling – namespaces – array – structs – OOP concepts – classes – abstract data type – constructors – destructors - conversions – inheritance – operator overloading.	10
III	**INTERFACE AND INHERITANCE** Interfaces – Indexes – Delegates – Events – Variable argument Lists – Collection – Reflection – Events – Variable argument lists – collection – reflection – dynamic creation and invocation – Preprocessor.	9
IV	**I/O & WINDOWS PROGRAMMING** File and Folder operations – Dates and Times – browsing the Internet – Windows Form Controls – Advanced windows – Form features using dialogs.	9
V	**WEB & DATABASE** Developing Windows Applications – Accessing data with ADO.NET, .NET assemblies, Web programming basics – Web services – Case Study.	10
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: To learn the basics of .net Frame work and C# language.
CO2: To learn C# elements and OOPS concepts.
CO3: To learn interface and inheritance concepts in C# language.
CO4: To learn fundamentals of window application programming and create a window application.
CO5: To develop web applications and learn advanced features of C#.

TEXT BOOKS:

T1 - Stanley B.Lippman , "C# Primer : A practical approach", Pearson Education,1991.
T2 - David.S.Platt, Introducing Microsoft . Net , Microsoft Press, 3rd, Edition, 2003.

REFERENCE BOOKS :

R1 -Ben Albahari, Pter Drayton, Brad Merrill, "C# Essentials", Oreilly& Associates, 2001.
R2 - E.Balagurusamy, Programming in C # Tata McGraw Hill, 2002.
R3 - Conard.J., et.al., Introducting .Net, wrox Press, 2000.
R4 - Eric Gunnerson , "A Programmers Introduction to C# ",A Press, 2000.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
BE	16CS7302	BIOMETRICS	3	0	0	3

Course Objective

1. To provide students with understanding of biometrics, biometric equipment and standards applied to security.
2. Perform R&D on biometrics methods and systems
3. Evaluate and design security systems incorporating biometrics
4. Understand the technology of biometrics for public policy matters involving security and privacy.
5. To learn some basic biometrics systems based on the learned techniques.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Biometric fundamentals – Biometric technologies – Biometrics Vs traditional techniques – Characteristics of a good biometric system – Benefits of biometrics – Key biometric processes: verification, identification and biometric matching – Assessing the privacy risks of biometrics - Designing privacy sympathetic biometric systems, Different biometric standards, Application properties - Performance measures in biometric systems: FAR, FRR, FTE rate, EER and ATV rate.	9
II	**PHYSIOLOGICAL BIOMETRICS** Physiological Biometric Technologies: Fingerprints - Technical description –characteristics - Competing technologies - strengths – weaknesses – deployment - Facial scan - Technical description - characteristics - weaknesses-deployment - Iris scan - Technical description – characteristics - strengths – weaknesses – deployment - Retina vascular pattern - Technical description – characteristics - strengths – weaknesses –deployment - Hand scan - Technical description-characteristics - strengths – weaknesses deployment – DNA biometrics.	9
III	**AUTOMATED BIOMETRIC SYSTEM AND BEHAVIOURAL BIOMETRICS** Automated fingerprint identification systems - Leading technologies: Behavioral Biometric Technologies: Handprint Biometrics - DNA Biometrics - signature and handwriting technology - Technical description – classification - keyboard / keystroke dynamics - Voice – data acquisition - feature extraction - characteristics - strengths – weaknesses- deployment.	9
IV	**BIOMETRIC APPLICATIONS** 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 - Multi biometrics: Multi biometrics and multi factor biometrics - two-factor authentication with passwords - tickets and tokens – executive decision - implementation Plan.	9
V	**PRIVACY AND STANDARDS IN BIOMETRICS** Assessing the Privacy Risks of Biometrics – Designing Privacy-Sympathetic Biometric Systems – Need for standards – different biometric standards. CASE STUDIES: Physiological, Behavioural and multifactor biometrics in identification systems.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Demonstrate knowledge of the basic physical and biological science and engineering principles underlying biometric systems.
CO2: Understand and analyze biometric systems at the component level and be able to analyze and design basic biometric system applications.
CO3: Be able to work effectively in teams and express their work and ideas orally and in writing.
CO4: Identify the sociological and acceptance issues associated with the design and implementation of biometric systems.
CO5: Understand various Biometric security issues.

TEXT BOOKS:

T1- Samir Nanavati, Michael Thieme, Raj Nanavati, "Biometrics – Identity Verification in a Networked World", Wiley-dreamtech India Pvt Ltd, New Delhi, 2003

T2- Paul Reid, "Biometrics for Network Security", Pearson Education, New Delhi, 2004.

T3- John Chirillo and Scott Blaul "Implementing Biometric Security", 1st Edition, Wiley Eastern Publication, 2005.

REFERENCE BOOKS :

R1- John R Vacca, "Biometric Technologies and Verification Systems", Elsevier Inc, 2007
R2- Anil K Jain, Patrick Flynn, Arun A Ross, "Handbook of Biometrics", Springer, 2008
R3- Samir Nanavathi, Michel Thieme, and Raj Nanavathi, "Biometrics -Identity verification in a network", Wiley Eastern, 2002.
R4- John Chirillo and Scott Blaul," Implementing Biometric Security", Wiley Eastern Publications, 2005.
R5- John Berger," Biometrics for Network Security", Prentice Hall, 2004.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS7303	E- COMMERCE	3	0	0	3

Course Objective

1. The students can understand basic idea about internet, WWW and its applications
2. The students can understand basic idea about internet, WWW and its applications
3. The students will study about Electronic Data Interchange and its applications
4. The students will study about electronic payment system and its security
5. The students will study about web based marketing and online advertisement

Unit	Description	Instructional Hours
I	**INTRODUCTION** History of E- Commerce – Overview of E- Commerce framework –E- Business models – Network infrastructure - Role of Internet – E- commerce and World wide Web.	9
II	**E COMMERCE** Packet switched networks – TCP/IP protocol script – Internet utility programmes – SGML, HTML and XML – web client and servers – Web client/server architecture – intranet and extranets.	9
III	**ORGANIZATIONAL COMMERCE AND EDI** Electronic Data Interchange – EDI applications in Business – EDI and E - Commerce – EDI standardization and implementation – Internet based EDI.	9
IV	**SECURITY** Internet security standards – secure electronic payment protocols ; cryptography and authentication – security issues – encryption techniques; e commerce payment mechanisms –SET protocol – electronic check – electronic cash; E-commerce ethics, regulations and social responsibility	9
V	**INTELLIGENT AGENTS** Definition and capabilities – limitation of agents – security – web based marketing – search engines and Directory registration – online advertisements – Portables and info mechanics – website design issues.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: The students should be able to discuss the trends in e-Commerce and the use of the Internet
CO2: The students should be able to use the technologies required to design and develop web site and web-based applications
CO3: Identify and explain fundamental web site tools including design tools, programming tools, and data processing tools
CO4: The students will be able to Identify legal, ethical, social, and privacy issues in e-commerce applications
CO5: The students will be able to use web based marketing and online advertisement

TEXT BOOKS:

T1 - Ravi Kalakota and Andrew B Whinston, " *Frontiers of Electronic Commerce* ",Pearson Education Asia, 1999.
T2 - Marilyn Greenstein and Todd M Feinman , " *Electronic commerce: Security, Risk Management andControl* " Tata McGraw-Hill , 2000.
T3 - Gary P Schneider "Electronic commerce", Thomson learning & James T Peny Cambridge USA, 2001.

REFERENCE BOOKS :

R1 - Pete Lohsin , John Vacca "Electronic Commerce", New Age International.
R2 - Goel, Ritendra "E-commerce", New Age International.
R3 - Laudon, "E-Commerce: Business, Technology, Society", Pearson Education.
R4 - Bajaj and Nag, "E-Commerce the cutting edge of Business", TMH.
R5- Turban, "Electronic Commerce 2004: A Managerial Perspective", Pearson Education.

PROGRAM	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS7304	WIRELESS SENSOR NETWORKS	3	0	0	3

Course Objective

1. Understand the design issues in ad hoc and sensor networks.
2. Learn the different types of MAC protocols.
3. Be familiar with different types of adhoc routing protocols.
4. Be exposing to the TCP issues in adhoc networks.
5. Learn the architecture and protocols of wireless sensor networks.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Introduction: Fundamentals of wireless communication technology, the electromagnetic spectrum radio propagation, characteristics of wireless channels, modulation techniques, multiple access techniques, wireless LANs, PANs, WANs, and MANs, Wireless Internet.	9
II	**MAC PROTOCOLS FOR WIRELESS NETWORKS** Introduction to adhoc/sensor networks: Key definitions of adhoc/ sensor networks, unique constraints and challenges, advantages of ad-hoc/sensor network, driving applications, issues in adhoc wireless networks, issues in design of sensor network, sensor network architecture, data dissemination and gathering	9
III	**DATA STORAGE AND MANIPULTATION IN WSN** Data Storage and Manipulation: Data centric and content based routing, storage and retrieval in network, compression technologies for WSN, Data aggregation technique. Applications: Detecting unauthorized activity using a sensor network, WSN for Habitat Monitoring.	9
IV	**WIRELESS SENSOR NETWORKS (WSNS) AND MAC PROTOCOLS** Single node architecture: hardware and software components of a sensor node – WSN Network architecture: typical network architectures-data relaying and aggregation strategies -MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC- IEEE 802.15.4.	9
V	**WSN ROUTING & QOS** Routing Protocols: Issues in designing a routing protocol, classification of routing protocols, table-driven, on-demand, hybrid, flooding, hierarchical, and power aware routing protocols. QoS and Energy Management : Issues and Challenges in providing QoS, classifications, MAC, network layer solutions, QoS frameworks, need for energy management, classification, battery, transmission power, and system power management schemes.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Explain the concepts, network architectures and applications of ad hoc and wireless sensor networks.
CO2: Analyze the protocol design issues of ad hoc and sensor networks
CO3: Design routing protocols for ad hoc and wireless sensor networks with respect to some protocol design issues
CO4: Evaluate the QoS related performance measurements of WIRE LESS sensor networks
CO5: Introduced to some existing applications of wireless sensor actuator networks

TEXT BOOKS:

T1 - C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ", Prentice Hall Professional Technical Reference, 2008.

REFERENCE BOOKS:

R1 - Carlos De Morais Cordeiro, Dharma Prakash Agrawal "Ad Hoc & Sensor Networks: Theory and Applications", World Scientific Publishing Company, 2006.
R2 - Feng Zhao and Leonides Guibas, "Wireless Sensor Networks", Elsevier Publication – 2002.
R3 - Holger Karl and Andreas Willig "Protocols and Architectures for Wireless Sensor Networks", Wiley, 2005.
R4 - Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks-Technology, Protocols, and Applications", John Wiley, 2007.
R5 - Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
BE	16CS7305	DATA MINING AND WAREHOUSING	3	0	0	3

Course Objective

1. Understand the basic concepts of Data mining
2. Understand the basic concepts of data warehousing
3. To study the methodology of engineering legacy databases for data warehousing and data mining to derive business rules for decision support systems.
4. To analyze the data, identify the problems, and choose the relevant models andalgorithms to apply.
5. Learn about Rule mining and Classification

Unit	Description	Instructional Hours
I	**DATA MINING** Introduction to Data Mining; Knowledge Discovery in Database (KDD), What can be Data to be Mined, Related Concept to Data Mining, Data Mining Technique, Application and Issues in Data Mining – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Data Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse – Issues –Data Preprocessing.	9
II	**DATA WAREHOUSING** The Need for Data Warehousing- Benefits of Data Warehousing -Features of a Data Warehouse- Data warehousing Components –Building a Data warehouse –- Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – The Information Flow Mechanism; Role of Metadata; Classification of Metadata.	9
III	**BUSSINESS ANALYSIS** Reporting and Query tools and Applications – Tool Categories – The Need for Applications – Cognos Impromptu – Online Analytical Processing (OLAP) – Need – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multirelational OLAP – Categories of Tools – OLAP Tools and the Internet.	9
IV	**MINING FREQUENT PATTERN AND ASSOCIATION RULE** Market Basket Analysis- Frequent Itemsets- Closed Itemsets, and Association Rules; Frequent Pattern Mining, Efficient and Scalable Frequent Itemset Mining Methods -The Apriori Algorithm for finding Frequent Itemsets Using Candidate Generation -Generating Association Rules from Frequent Itemsets, Improving the Efficiency of Aprior- A pattern growth approach for mining Frequent Itemsets; Mining Frequent itemsets using vertical data formats-Mining closed and maximal patterns;	9
V	**ASSOCIATION RULE MININNG AND CLASSIFICATION** Introduction to Mining Multilevel Association Rules and Multidimensional Association Rules; From Association Mining to Correlation Analysis, Pattern Evaluation Measures; Classification: Basic Concepts; Classification methods: Decision Tree Induction: Attribute Selection Measures, Tree pruning. 2. Bayesian Classification: Naïve Bayes' Classifier. Prediction: Structure of regression models; Simple linear regression, Multiple linear regression.Model Evaluation & Selection: Accuracy and Error measures, Holdout, Random Sampling, Cross Validation, Bootstrap; Comparing Classifier performance using ROC Curves**.**	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Enable students to understand and implement classical algorithms in data mining and data warehousing.
CO2 students will be able to assess the strengths and weaknesses of the algorithms.
CO3: To identify the application area of algorithms, and apply them.
CO4: Students would learn data mining techniques as well as methods in integrating and interpreting the data sets
CO5:To improve effectiveness, efficiency and quality for data analysis.

TEXT BOOKS:

T1 - Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann 3nd Edition
T2 - Alex Berson and Stephen J. Smith, " Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.
T3- Paulraj Ponniah, "Data Warehousing: Fundamentals for IT Professionals", Wiley India
T4- Reema Theraja "Data warehousing", Oxford University Press.

REFERENCE BOOKS :

R1- Pang-Ning Tan, Michael Steinbach and Vipin Kumar, " Introduction To Data Mining", Person Education, 2007.
R2- K.P. Soman, Shyam Diwakar and V. Ajay ", Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006.
R3- G. K. Gupta, " Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
R4- Daniel T.Larose, "Data Mining Methods and Models", Wile-Interscience, 2006.
M.H. Dunham, "Data Mining Introductory and Advanced Topics", Pearson Education

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
BE	16CS7306	DIGITAL SIGNAL PROCESSING	3	0	0	3

Course Objective

1. To understand the structures of Discrete time signals and systems
2. To introduce discrete Fourier transform and its applications
3. To learn the Frequency response characteristics and to design FIR filters
4. To learn the Frequency response characteristics and to design IIR filters
5. To study the fundamentals of DSP Processor- TMS320C5X

Unit	Description	Instructional Hours
I	**SIGNALS AND SYSTEMS** Basic elements of DSP – concepts of frequency in Analog and Digital Signals – sampling theorem –Discrete – time signals, systems – Analysis of discrete time LTI systems – Z transform – Convolution– Correlation.	9
II	**FOURIER ANALYSIS AND FOURIER TRANSFORM** Discrete Time Fourier Transform(DTFT) – Properties of DTFT – The frequency domain representation of LTI systems- Sampling and Reconstruction of Analog signals- Discrete Fourier Transform – The discrete Fourier series- sampling and reconstruction in the Z domain– Discrete Fourier Transform- Properties of Discrete Fourier transform- Linear convolution using the DFT- Fast Fourier Transform.	9
III	**IIR FILTER DESIGN** Structures of IIR – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – (LPF, HPF, BPF, BRF) filter design using frequency translation.	9
IV	**FIR FILTER DESIGN** Structures of FIR – Linear phase FIR filter – Fourier Series - Filter design using windowing techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency sampling techniques	9
V	**UNIT V DSP PROCESSOR FUNDAMENTALS** Architecture and features: Features of DSP processors - DSP processor packaging(Embodiments) - Fixed point Vs floating point DSP processor data paths - Memory architecture of a DSP processor (Von Neumann - Harvard) - Addressing modes - pipelining - TMS320 family of DSPs (architecture of C5x).	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Perform frequency transforms for the signals
CO2 To implement DFTs using Fast Fourier Transforms
CO3: Design IIR filters
CO4: Design FIR filters
CO5: Learn the architecture details and instruction sets of fixed and floating point DSPs

TEXT BOOKS:

T1 - John. G. Proakis and Dimitris C. Manolakis, "Digital Signal Processing Principles, Algorithms and Applications," Pearson Education, Third edition 2006.
T2 - Venkataramani B., M.Bhaskar, "Digital Signal Processors, Architecture, Programming and Application", First Edition ,Tata McGraw Hill, New Delhi, 2008.
T3 - T4 - Hayes M.H., "Digital Signal Processing ", Schaum's Outlines, TATA Mc-Graw Hill, Tata McGraw Hill, Second Edition New Delhi, 2007

REFERENCE BOOKS :

R1 - Emmanuel C.Ifeachor, and Barrie.W.Jervis, "Digital Signal Processing", Second Edition, Pearson Education, Prentice Hall, 2002.
R2 - Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", Third Edition, Tata Mc Graw Hill, 2007.
R3 - A.V.Oppenheim, R.W. Schafer and J.R. Buck, Discrete-Time Signal Processing, 8th Indian Reprint, Pearson, 2004
R4 - Andreas Antoniou, "Digital Signal Processing", Tata McGraw Hill, 2006.

ELECTIVE - IV

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS7307	TEXT MINING	3	0	0	3

Course Objective

1. To understand the basic issues and types of text mining
2. To appreciate the different aspects of text categorization and clustering
3. To understand the role played by text mining in Information retrieval and extraction
4. To appreciate the use of probabilistic models for text mining
5. To appreciate the current trends in text mining

Unit	Description	Instructional Hours
I	**INTRODUCTION** Overview of text mining- Definition- General Architecture– Algorithms– Core Operations – Preprocessing–Types of Problems-basics of document classification-information retrieval-clustering andOrganizing documents-information extraction-prediction andevaluation-Textual information to numerical vectors-Collectingdocuments-document standardization- tokenization-lemmatization-vector generation for prediction- sentence boundary determination -evaluation performance.	9
II	**TEXT CATEGORIZATION AND CLUSTERING** Text Categorization – Definition – Document Representation –Feature Selection - Decision Tree Classifiers - Rule-based Classifiers - Probabilistic and Naive Bayes Classifiers - Linear Classifiers-Classification of Linked and Web Data - Meta-Algorithms– Clustering –Definition-Vector Space Models - Distance-based Algorithms- Word and Phrase-based Clustering -Semi-Supervised Clustering - Transfer Learning	9
III	**TEXT MINING FOR INFORMATION RETRIEVAL AND INFORMATION** Information retrieval and text mining- keyword search- nearest-neighbor methods- similarity-webbased document search- matching-Inverted lists- evaluation. Information Extraction-Architecture-Co-Reference-Named Entity and Relation Extraction-TemplateFilling and database construction–Applications.Inductive -Unsupervised Algorithms for Information Extraction. Text Summarization Techniques - Topic Representation - Influence of Context - Indicator Representations – Pattern Extraction - Apriori Algorithm – FP Tree algorithm	9
IV	**PROBABILISTIC** Probabilistic Models for Text Mining -Mixture Models - Stochastic Processes in Bayesian Nonparametric Models - Graphical Models - Relationship Between Clustering, Dimension Reduction and Topic Modeling - Latent Semantic Indexing - Probabilistic Latent Semantic Indexing -Latent Dirichlet Allocation- Interpretation and Evaluation - Probabilistic Document Clustering and Topic Models - Probabilistic Models for Information Extraction - Hidden Markov Models -Stochastic Context-Free Grammars - Maximal Entropy Modeling - Maximal Entropy Markov Models -Conditional Random Fields	9
V	**RECENT TRENDS** Visualization Approaches - Architectural Considerations - Visualization Techniques in Link Analysis - Example- Mining Text Streams - Text Mining in Multimedia - Text Analytics in Socia Media - Opinion Mining and Sentiment Analysis - Document Sentiment Classification – Opinion Lexicon Expansion - Aspect-Based Sentiment Analysis - Opinion Spam Detection – Text MiningApplications and Case studies	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Identify the different features that can be mined from text and web documents
CO2: Use available open source classification and clustering tools on some standard text data sets
CO3: Modify existing classification/clustering algorithms in terms of functionality or features used
CO4: Design a system that uses text mining to improve the functions of an existing open source search engine
CO5: Implement a text mining system that can be used for an application of your choice

TEXT BOOKS:

T1 - .Sholom Weiss, Nitin Indurkhya, Tong Zhang, Fred Damerau "The Text Mining Handbook:Advanced Approaches in Analyzing Unstructured Data", Springer, paperback 2010

T2 - Ronen Feldman, James Sanger -" The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data"-Cambridge University press, 2006.

REFERENCE BOOKS:

R1 - Manu Konchady "Text Mining Application Programming", CengageLearing, Fourth Indian Reprint, 2009.
R2 - Thomas W. Miller, Prentice Hall, "Data and Text Mining-A Business Applications Approach", Second impression, 2011.
R3 - Charu C. Aggarwal ,ChengXiangZhai,Mining Text Data, Springer; 2012

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
BE	16CS7308	SOFT COMPUTING	3	0	0	3

Course Objective

1. Study an overview of Artificial Neural Networks
2. Learn about Fuzzy systems.
3. Understand the Special networks.
4. Learn about Genetic algorithms
5. Understand the applications of soft computing.

UNIT	DESCRIPTION	TOTAL INSTRUCTIONAL HOURS
I	**ARTIFICIAL NEURAL NETWORKS** Fundamental Concept - Basic Model of ANN - Terminologies of ANN - Supervised Learning Neural Networks: Perception Networks - Adaptive Linear Neuron - Multiple Adaptive Linear Neurons – Back Propagation Network - Unsupervised Learning Neural Networks: Kohenen self-organizing Feature Maps- Learning vector Quantization	10
II	**FUZZY SYSTEMS** Classical sets - Fuzzy sets - Classical relation - Fuzzy relations - Defuzzification - Fuzzy rule base and approximate reasoning: Fuzzy reasoning - Fuzzy Inference Systems - Fuzzy decision making – Fuzzy logic control systems.	10
III	**SPECIAL NETWORKS** Counter propagation Networks - Adaptive Resonance Theory Network - Simulated Annealing Network -Boltzmann Machine - Gaussian Machine - Cauchy Machine - Probabilistic Neural Net – Cascade Correlation Network.	9
IV	**GENETIC ALGORITHMS** Introduction - Basic operators and terminologies in GA - Traditional vs Genetic Algorithm - Simple GA -General Genetic Algorithm - Classification of Genetic Algorithm - Holland classifier systems – Genetic Programming.	8
V	**APPLICATIONS OF SOFT COMPUTING** Image Fusion - Neural network classification - Traveling salesman problem using Genetic algorithm -Genetic algorithm based Internet searching technique - Soft Computing Based Hybrid Fuzzy Controllers - Soft Computing Based Rocket Engine Control.	8
	TOTAL INSTRUCTIONAL HOURS	45

course outcome

- Demonstrate different types of artificial neural networks.
- Explain the concept of fuzzy systems.
- Summarize the various special networks.
- Develop the solutions using genetic algorithms.
- Develop application using soft computing tehniques.

REFERENCE BOOKS:

R1. S.N.Sivanandam and S.N.Deepa, Principles of Soft Computing, Wiley India Ltd,2011
R2. Timothy J.Ross, Fuzzy Logic with Engineering Applications, McGraw-Hill, 2000
R3. Davis E.Goldberg, Genetic Algorithms: Search, Optimization and Machine Learning, Addison Wesley, N.Y., 2001.
R4.Jang.J.S.R.Sun.C.T.and Mizutami.E, Neuro fuzzy and Soft computing, Prentice Hall, New Jersey-2010

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
BE	16CS7309	HUMAN INTERFACE SYSTEM DESIGN	3	0	0	3

Course Objective

1. To learn the basic fundamentals of the HISD.
2. To learn the various aspects of managing the human interface design.
3. To understand the various aspects involved in virtual environment and manipulation.
4. To be familiar with various interfaces available.
5. To design the web page and communicate other resource

Unit	Description	Instructional Hours
I	**INTRODUCTION** Goals of System Engineering - Goals of User Interface Design - Motivations of Human factors in Design - High Level Theories - Object - Action Interface Design - Three Principles - Guidelines for Data Display and Data Entry.	9
II	**MANAGING DESIGN PROCESS** Introduction - Examples of Direct Manipulation Systems - Explanation of Direct Manipulation - Visual Thinking and Icons - Direct manipulation Programming - Home Automation - Remote Direct Manipulation - Virtual Environments - Task - Related Organization - Item Presentation Sequence - Response Time and Display Rate - Fast Movement Through Menus - Menu Layouts - Form Fillin - Dialog Box - Functionality to Support User's Tasks - Command Organization Strategies - Benefits of Structure -Naming and Abbreviations - Command Menus - Natural Language in Computing.	9
III	**MANIPULATION AND VIRTUAL ENVIRONMENTS** Introduction - Examples of Direct Manipulation Systems - Explanation of Direct Manipulation - Visual Thinking and Icons - Direct Manipulation Programming - Home Automation - Remote Direct Manipulation - Virtual Environments - Task -Related Organization - Item Presentation Sequence - Response Time and Display Rate - Fast Movement Through Menus - Menu Layouts - Form Fillin - Dialog Box - Functionality to Support User's Tasks - Command Organization Strategies - Benefits of Structure - Naming and Abbreviations - Command Menus - Natural Language in Computing.	9
IV	**INTERACTION DEVICES** Introduction: Keyboards and Functions – Pointing Devices - Speech recognition, Digitization and Generation – Image and Video Displays – Printers –Theoretical Foundations –Expectations and Attitudes – User Productivity – Variability – Error messages – Nonanthropomorphic Design –Display Design – color - Reading from Paper versus from Displays - Preparation of Printed Manuals - Preparation of Online Facilities.	9
V	**WINDOWS STRATEGIES AND INFORMATION SEARCH** Introduction - Individual Widow Design - Multiple Window Design - Coordination by Tightly - Coupled Widow - Image Browsing - Personal Role Management and Elastic Windows - Goals of Cooperation - Asynchronous Interaction - Synchronous Distributed - Face to Face - Applying Computer Supported Cooperative Work to Education - Database query and phrase search in Textual documents - Multimedia Documents Searches - Information Visualization - Advance Filtering Hypertext and Hypermedia - World Wide Web - Genres and Goals and Designers - Users and their tasks - Object Action Interface Model for Website Design.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Describe the basic fundamentals of the HISD.
CO2: Examine the various aspects of managing human interface design.
CO3: Describe the various aspects involved in virtual environment and manipulation.
CO4: Identify various interfaces available.
CO5: Describe the web page and communicate other resource

TEXT BOOKS:

T1 - Ben Shneiderman J., "Designing the User Interface", 3rd Edition, Addison “Wesley, 2001.
T2 - Robert D.Braun, Introduction to Instrumental Analysis, PharmaMed Press/BSP books, Second edition, 2012

REFERENCE BOOKS:

R1 - Wilbert O. Galiz, "The Essential guide to User Interface Design", Wiley Dreamtech, 2002.
R2 - Jacob Nielsen, "Usability Engineering", Academic Press, 1993.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
BE	16CS7310	ARTIFICIAL INTELLIGENCE	3	0	0	3

Course Objective

1. Understand the problem solving intelligent agents
2. Understand about searching techniques.
3. Impart domain knowledge in propositional and first-order logic.
4. Learn about Planning.
5. Formulate and solve optimization challenges as planning problems.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Intelligent Agents -Agents and environments-Good behavior-The nature of environments - Structure of agents -Problem Solving-Problem solving agents-Uniformed search strategies-heuristic function.	9
II	**SEARCHING TECHNIQUES** Local search algorithms and optimization problems -Local search in continuous spaces-Online search agents and unknown environments-optimal Decisions in games-Constraint satisfaction problems(CSP)	9
III	**KNOWLEDGE REPRESENTATION** First order logic : Representation revisited -Syntax and semantics for first order logic-Using first order logic-Knowledge engineering in first order logic-Inference in First order logic: Prepositional versus first order logic-Unification and lifting-Forward chaining -Backward chaining**.**	9
IV	**PLANNING** Classical planning: Definition of Classical Planning -Algorithms for Planning as State -Space Search-Planning Graphs-Other Classical Planning Approaches-Analysis of Planning Approaches-Time, Schedules, and Resources-Hierarchical Planning-Planning and Acting in Nondeterministic Domains-Multiagent Planning	9
V	**LEARNING** Learning from examples: Forms of learning -supervised learning-Learning decision trees-Ensemble learning-A Logical formulation of learning-Knowledge in learning- Explanation based learning-Learning using relevant information.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Explain the characteristics of AI that make it useful to real -world problems
CO2: Explicate the different searching techniques.
CO3: Explore the domain knowledge representation in propositional and first-order logic..
CO4: Recognize the planning process of various state-space search algorithms, and choose the appropriate algorithm for a problem.
CO5: Implement the different techniques for learning and reasoning under uncertainty.

REFERENCE BOOKS

R1.Russell, Peter Norvig, Artificial Intelligence A Modern Approach, 3rd Edition, Prentice Hall of India, 2010
R2.Nils J. Nilsson, Artificial Intelligence: A new Synthesis, Harcourt Asia Pvt. Ltd., 2000
R3. Elaine Rich and Kevin Knight, Artificial Intelligence, 3rd Edition, Tata McGraw-Hill, 2011
R4. George F. Luger, Artificial Intelligence-Structures And Strategies For Complex Problem Solving, Pearson Education / PHI, 2002

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS7311	HIGH SPEED NETWORKS	3	0	0	3

Course Objective

1. To learn the basis of ATM and Frame relay concepts and explain the various types of LAN's and to know about their applications.
2. To know techniques involved to support real-time traffic and congestion control in ATM
3. To learn the basis of ISA and explain the various types of queuing discipline.
4. To understand the protocols for quality of service (Qos) to different applications.
5. To study wireless network operations and functions

UNIT	DESCRIPTION	TOTAL INSTRUCTIONAL HOURS
I	**HIGH SPEED NETWORKS** Introduction-frame relay networks –ATM protocol architecture-ATM logical connection –ATM cells-ATM service categories -AAL- High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel – Wireless LANs	9
II	**CONGESTION AND TRAFFIC MANAGEMENT** Congestion control in data networks and internets-link level flow and error control-TCP traffic -congestion control in ATM networks-Internet Routing: Interior routing protocols.	9
III	**INTEGRATED AND DIFFERENTIATED SERVICES** Integrated Services (IntServ), Queuing Discipline- FQ, PS, BRFQ, GPS, WFQ, Random Early Detection, Differentiated Services (DiffServ)	9
IV	**PROTOCOLS FOR QOS SUPPORT** Resource Reservation Protocol (RSVP), Multiprotocol Label Switching (MPLS), Real-Time Transport Protocol (RTP), RTCP, IP version six.	9
V	**LOCAL BROAD BAND AND AD HOC NETWORKS** Introduction to wireless LANS-IEEE 802.11 WLAN-Wireless ATM-HIPERLAN-Ad hoc networking and WPAN.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Understand the basics of high speed networking technologies.
CO2: Compare and contrast the congestion control mechanism and traffic management used in high speed network environment.
CO3: Describe the concepts of ISA and various queuing discipline.
CO4: State the Quality of Service (QoS) in IP Networks and evaluate their performances
CO5: Describe the concepts of wireless network operations and functions

TEXT BOOKS:

T1 - Williams Stallings, "High Speed networks And Internet Performance And Quality Of Service", Pearson Second Edition, 2002.

T2 -KavenPahlavanAnd Prashant Krishnamoorthy, "Principles Of Wireless Network", Prentice Hall Of India, 2010.

REFERENCE BOOKS :

R1 - Behrouz A. Forouzan, "Data Communication And Computer Networking", 4th, 2011.

R2 - Larry L. Peterson and Bruce S.Davie, "Computer Networks", Third edition, Elsevier Publications, 2003

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
BE	16CS7312	SEMANTIC WEB	3	0	0	3

Course Objective

1. To understand the need of semantic web in web services
2. To know the methods to discover, classify and build ontology for more reasonable results in searching.
3. To implement the RDF structure and Model
4. To build and implement a small ontology that is semantically descriptive of chosen problem domain.
5. To implement applications that can access, use and manipulate the ontology

Unit	Description	Instructional Hours
I	**INTRODUCTION** Introduction to the Syntactic web and Semantic Web – Evolution of the Web – The visual and syntactic web – Levels of Semantics – Metadata for web information - The semantic web architecture and technologies –Contrasting Semantic with Conventional Technologies – Semantic Modeling - Potential of semantic web solutions and challenges of adoption	9
II	**ONTOLOGICAL ENGINEERING** Ontologies – Taxonomies –Topic Maps – Classifying Ontologies – Terminological aspects: concepts, terms, relations between them – Complex Objects –Subclasses and Sub-properties definitions –Upper Ontologies – Quality – Uses - Types of terminological resources for ontology building –Methods and methodologies for building ontologies – Multilingual Ontologies -Ontology Development process and Life cycle – Methods for Ontology Learning – Ontology Evolution – Versioning	9
III	**STRUCTURING AND DESCRIBING WEB RESOURCES** Structured Web Documents - XML – Structuring – Namespaces – Addressing – Querying – Processing - RDF – RDF Data Model – Serialization Formats- RDF Vocabulary –Inferencing - RDFS –basic Idea – Classes – Properties- Utility Properties – RDFS Modeling for Combinations and Patterns-Transitivity	9
IV	**WEB ONTOLOGY LANGUAGE** OWL – Sub-Languages – Basic Notions -Classes- Defining and Using Properties – Domain and Range – Describing Properties - Data Types – Counting and Sets- Negative Property Assertions – Advanced Class Description – Equivalence – Owl Logic.	9
V	**SEMANTIC WEB TOOLS AND APPLICATIONS** Development Tools for Semantic Web – Jena Framework – SPARL –Querying semantic web - Semantic Wikis - Semantic Web Services – Modeling and aggregating social network data - Ontological representation of social relationships, Aggregating and reasoning with social network data.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Able to understand semantic web basics, architecture and technologies
CO2: Able to represent data from a chosen problem in XML with appropriate semantic tags obtained or derived from the ontology
CO3: Able to understand the semantic relationships among these data elements using Resource Description Framework (RDF)
CO4: Able to design and implement a web services application that "discovers" the data and/or other web services via the semantic web.
CO5: Able to discover the capabilities and limitations of semantic web technology for social networks

TEXT BOOKS:

T1 - Williams Stallings, "High Speed networks And Internet Performance And Quality Of Service", Pearson Second Edition, 2002.
T2 -KavenPahlavanAnd Prashant Krishnamoorthy, "Principles Of Wireless Network", Prentice Hall Of India, 2010.

REFERENCE BOOKS:

R1 - John Hebeler, Matthew Fisher, Ryan Blace and Andrew Perez-Lopez, "Semantic Web Programming",Wiley, First Edition, 2009.

R2 - Grigoris Antoniou, Frank van Harmelen, "A Semantic Web Primer", Second Edition (Cooperative Information Systems) (Hardcover), MIT Press, 2008

R3 - Robert M. Colomb, "Ontology and the Semantic Web", Volume 156 Frontiers in Artificial Intelligence and Applications (Frontier in Artificial Intelligence and Applications), IOS Press, 2007.

R4 - Dean Allemang and James Hendler, "Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL, Morgan Kaufmann", Second Edition, 2011.

R5 - Michael C. Daconta, Leo J. Obrst and Kevin T. Smith, "The Semantic Web: A Guide to the Future of XML,Web Services, and Knowledge Management",Wiley, First Edition 2003

R6 - Karin Breitman, Marco Antonio Casanova and Walt Truszkowski, "Semantic Web: Concepts, Technologies and Applications (NASA Monographs in Systems and Software Engineering)", Springer, Softcover, 2010.

R7 - VipulKashyap, Christoph Bussler and Matthew Moran, "The Semantic Web: Semantics for Data and Services on theWeb (Data-Centric Systems and Applications), Springer, 2008.

R8 - Peter Mika, "Social networks and the SemanticWeb", Springer, 1st edition 2007.

ELECTIVE-V

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS8301	SOFTWARE PROJECT MANAGEMENT	3	0	0	3

Course Objective

1. Learn about Project Evaluation and Project Planning
2. Understand the concepts of Project life cycle and effort estimation
3. To highlight different techniques for software cost estimation and activity planning
4. Study about Project Management and Control
5. Learn about hoew to manage people

Unit	Description	Instructional Hours
	PROJECT EVALUATION AND PROJECT PLANNING	
I	Importance of Software Project Management–Activities Methodologies–Categorization of Software Projects–Setting objectives–Management Principles–Management Control–Project portfolio Management–Cost-benefit evaluation technology–Risk evaluation–Strategic program Management–Stepwise Project Planning.	9
	PROJECT LIFE CYCLE AND EFFORT ESTIMATION	
II	Software process and Process Models–Choice of Process models-mental delivery–Rapid Application development–Agile methods–Extreme Programming–SCRUM–Managing interactive processes–Basics of Software estimation–Effort and Cost estimation techniques–COSMIC Full function points -COCOMO II A Parametric Productivity Model -Staffing Pattern	9
	ACTIVITY PLANNING AND RISK MANAGEMENT	
III	Objectives of Activity planning–Project schedules–Activities–Sequencing and scheduling –Network Planning models–Forward Pass & Backward Pass techniques–Critical path (CRM) method–Risk identification–Assessment–Monitoring–PERT technique–Monte Carlo simulation –Resource Allocation–Creation of critical patterns–Cost schedules	9
	PROJECT MANAGEMENT AND CONTROL	
IV	Framework for Management and control –Collection of data Project termination–Visualizing progress –Cost monitoring–Earned Value Analysis-Project tracking–Change control-Software Configuration Management–Managing contracts–Contract Management.	9
	STAFFING IN SOFTWARE PROJECTS	
V	Managing people–Organizational behavior–Best methods of staff selection–Motivation–The Oldham-Hackman job characteristic model–Ethical and Programmed concerns–Working in teams–Decision making–Team structures–Virtual teams–Communications genres–Communication plans.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1:Describe project evaluation and palnning
CO2:Explain project life cycle and effort estimation.
CO3:Discuss activity planning and risk management
CO4:Analyze project management and control.
CO5:Able to practice Project Management principles while developing a software

TEXTBOOK:

T1.Bob Hughes, Mike Cottere ll and Rajib Mall: Software Project Management–Fifth Edition, TataMcGraw Hill, New Delhi, 2012.

REFERENCE BOOKS

R1.Robert K. Wysocki "Effective Software Project Management"–Wiley Publication,2011.

R2.Walker Royce: "Software Project Management"-Addison-Wesley,1998.

R3.Gopalaswamy Ramesh, "Managing Global Software Projects"–McGraw Hill Education (India),Fourteenth Reprint 2013.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS8302	WEB TECHNOLOGY	3	0	0	3

Course Objective

1. Understand the scripting languages XHTML, JavaScript and PHP
2. Familiar with the different server technologies
3. Gain knowledge in the concepts of web services.
4. Study about Project Management and Control
5. Learn about hoew to manage people

Unit		
I	**INTRODUCTION TO WEB AND XHTML** Introduction - Blogging - Social Networking - Social media - Tagging - Software development - Introduction to XHTML and Editing XHTML Headings - Linking - Images - Special characters and Horizon rules - Lists - Tables - Forms -Internal Linking- Meta Elements - Cascading Style Sheets	10
II	**JAVASCRIPT** Introduction to scripting - Control statements I, II - Functions: Definition - Random Number Generation -Global function - Recursion - Arrays: Declaring and allocating arrays Multidimensional arrays - Objects :Math object - String object - Date object - Boolean, Number object - Document object - Window object -Events.	10
III	**INTERNET APPLICATION SERVER TECHNOLOGIES** Web server (IIS and Apache): Multitier Architecture - Client/ Server side scripting - Accessing web services - Microsoft IIS - Apache HTTP server - Database: Relational database - SQL - PHP: Basics -String and Form Processing - connecting to database - Ruby on Rails - Rail framework - Database driven web application	8
IV	**ASP .NET AND AJAX** Introduction - creating and running a simple web form - Web controls - session tracking - case study: Connecting to a database in ASP.NET. - Introduction to AJAX- AJAX XML Http request- AJAX Events..	9
V	**WEB SERVICES** Introduction - Java web services Basics - Creating Publishing, Testing and describing web service - Consuming web service - SOAP - Session Tracking in web services - Consuming a Database driven web service from a web application - Passing an object of a User defined type to a web service	8
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Explore the internet related technologies and hierarchy of objects in XHTML, CSS and Social media.
CO2: Design dynamic and interactive web pages by embedding Java Script code in XHTML.
CO3: Implement server side programming and build web applications using PHP.
CO4:Develop the interactive web applications using ASP.NET.
CO5:Build and consume web services.

REFERENCE BOOKS

R1. P.J. Deitel AND H.M. Deitel, Internet and World Wide Web - How to Program, Pearson Education, 2009.
R2. Deitel, Deitel and Nieto, Internet and World Wide Web How to Program, Pearson Education,2002.
R3. Uttam K.Roy, Web Technologies, Oxford University Press, 2010.
R4. Rajkamal, Web Technology, Tata McGraw-Hill, 2009.
R5. www.w3schools.com/ajax.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS8303	PERVASIVE COMPUTING	3	0	0	3

Course Objective

1. To provide the student with knowledge and skills about a new trend in computing.
2. To study about creating a ubiquitous environment.
3. To learn about connectivity of devices and web applications
4. To learn WAP and voice technology.
5. To study about architecture of PDA

Unit	Description	Instructional Hours
I	**INTRODUCTION** **Pervasive Computing**: Past, Present and Future - Pervasive computing Market – m-Business – Application examples: Retail, Airline check-in and booking – Healthcare – Car information system – E-mail access via WAP and voice.	9
II	**DEVICE TECHNOLOGY** Hardware – Human Machine Interfaces – Biometrics – Operating Systems – Java for Pervasive devices.	9
III	**DEVICE CONNECTIVITY & WEB APPLICATION CONCEPTS** Protocols – Security – Device Management - Web Application Concepts: WWW architecture – Protocols – Transcoding - Client Authentication via Internet.	9
IV	**WAP & VOICE TECHNOLOGY** **WAP and Beyond**: Components of the WAP architecture – WAP infrastructure – WAP security issues – WML – WAP push – Products – i-Mode – Voice Technology: Basics of Speech recognition- Voice Standards – Speech applications – Speech and Pervasive Computing.	9
V	**PDA & PERVASIVE WEB APPLICATION ARCHITECTURE** Device Categories – PDA operation Systems – Device Characteristics – Software Components - Standards – Mobile Applications - PDA Browsers - Pervasive Web Application architecture: Background – Development of Pervasive Computing web applications - Pervasive application architecture.	9
	Total Instructional Hours	**45**

Course Outcome

CO1:Learn the basics of pervasive computing and recent developments
CO2:Knowledge about various Human Computer interaction devices
CO3:Exposure on various connectivity models
CO4:Get idea on WAP technology and the working mechanism
CO5:Study of different architecture of PDA devices

TEXT BOOK

T1 - Jochen Burkhardt, Horst Henn, Stefan Hepper, Thomas Schaech & Klaus Rindtorff, "Pervasive Computing, Technology and Architecture of Mobile Internet Applications", Pearson Education, 2012.

REFERENCES

R1- Frank Adelstein, Sandeep KS Gupta, Golden Richard III, Loren Schwiebert, "Fundamentals of Mobile and Pervasive Computing", McGraw Hill edition, 2006.
R2 - Uwe Hansmann, L. Merk, Nicklous M., Stober T., Hansmann U., "Pervasive Computing (Springer Professional Computing)", 2003, Springer Verlag, ISBN:3540002189.
R3 - http://www.cs.iit.edu/courses/cs553.html
R4 - ttp://www.luc.ac/courses/bsc_computer-science-is.shtml
R5 - http://www.cs.cf.ac.uk/teaching/modules/CM0256.pdf

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS8304	DATABASE SECURITY AND PRIVACY	3	0	0	3

Course Objective

1. To understand the fundamentals of security, and how it relates to information systems
2. To identify risks and vulnerabilities in operating systems from a database perspective
3. To learn good password policies, and techniques to secure passwords in an organization
4. To get exposure about various auditing activities dome in servers
5. To learn on different security measures available for securing the database

Unit	Description	Instructional Hours
I	**SECURITY ARCHITECTURE & OPERATING SYSTEM SECURITY FUNDAMENTALS** **Security Architecture:** Introduction-Information Systems- Database Management Systems-Information Security Architecture- Database Security–Asset Types and value-Security Methods **Operating System Security Fundamentals:** Introduction-Operating System Overview-Security Environment – Components- Authentication Methods-User Administration-Password Policies-Vulnerabilities-E-mail Security	7
II	**ADMINISTRATION OF USERS & PROFILES,PASSWORD POLICIES, PRIVILEGES AND ROLES** **Administration of Users:** Introduction-Authentication-Creating Users, SQL Server User-Removing, Modifying Users-Default, Remote Users-Database Links-Linked Servers-Remote Servers-Practices for Administrators and Managers-Best Practices **Profiles, Password Policies, Privileges and Roles:** Introduction-Defining and Using Profiles-Designing and Implementing Password Policies-Granting and Revoking User Privileges-Creating, Assigning and Revoking User Roles-Best Practices	11
III	**DATABASE APPLICATION SECURITY MODELS & VIRTUAL PRIVATE DATABASES** **Database Application Security Models:** Introduction-Types of Users-Security Models-Application Types-Application Security Models-Data Encryption **Virtual Private Databases:** Introduction-Overview of VPD-Implementation of VPD using Views, Application Context in Oracle-Implementing Oracle VPD-Viewing VPD Policies and Application contexts using Data Dictionary, Policy Manager- Implementing Row and Column level Security with SQL Server	9
IV	**AUDITING DATABASE ACTIVITIES** **Auditing Database Activities:** Using Oracle Database Activities-Creating DLL Triggers with Oracle-Auditing Database Activities with Oracle-Auditing Server Activity with SQL Server 2000-Security and Auditing Project Case Study	7
V	**PRIVACY PRESERVING DATA MINING TECHNIQUES** **Privacy Preserving Data Mining Techniques**: Introduction- Privacy Preserving Data Mining Algorithms-General Survey-Randomization Methods-Group Based Anonymization-Distributed Privacy Preserving Data Mining-Curse of Dimensionality-Application of Privacy Preserving Data Mining	11
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1:Knowledge about secure OS and Architecture
CO2:Exposure of security privileges and policies for database
CO3:Study of virtual database and security model
CO4:Various auditing and management activities
CO5:To learn different mining methods involved in securing database

TEXT BOOKS

T1 - Hassan A. Afyouni, "Database Security and Auditing", Third Edition, Cengage Learning, 2009.(UNIT 1 to IV)
T2 - Charu C. Aggarwal, Philip S Yu, "Privacy Preserving Data Mining": Models and Algorithms, Kluwer Academic Publishers, 2008.(UNIT V).

REFERENCES

R1 - Ron Ben Natan, "Implementing Database Security and Auditing", Elsevier Digital Press, 2005.
R2 - http://charuaggarwal.net/toc.pdf
R3 - http://adrem.ua.ac.be/sites/adrem.ua.ac.be/files/securitybook.pdf

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS8305	R PROGRAMMING	3	0	0	3

Course Objective

1. To study the characteristics of the Multimedia data
2. To understand the Multimedia data Indexing and Retrieval
3. Understand the basics of R programming.
4. Gain knowledge about the data analysis and statistical models in R.
5. Impart knowledge about using graphics in R.

Unit	Description	Instructional Hours
I	**GETTING STARTED AND BASICS** Introduction to R -R Installation-Basic syntax-R as acalculator-R Libraries-Importing Data-Getting help and loading packages-Data entry and exporting data-Creating and Manipulating objects in R-Vectors-Matrices-Data Frames-Lists	9
II	**EXPLORATORY DATA ANALYSIS WITH R** Summary statistics-Validating & Exploring Data-Manipulating Data-Summarizing-Sorting-Sub -setting- Merging.	9
III	**GRAPHICS** Basic plotting -3D plotting-Histograms-Multi-panel plotting-Boxplots-ggplot2-Manipulating the plotting window-Advanced plotting using lattice library-Saving plots.	9
IV	**STANDARD STATISTICAL MODELS IN R** Univariate Analysis -Multivariate Analysis-Linear & Nonlinear Models-Logistic Regression and Survival Analysis in R	9
V	**ADVANCED R** Writing R functions-Introduction to Clustering and Classification-k-Means Partitioning-Partitioning around Mediods -Introduction to Unconstrained & Constrained Ordination-Principal Components Analysis (PCA)-Redundancy Analysis (RDA)	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Explain the basic concepts of R.
CO2.Illustrate exploratory data analysis with R.
CO3.Summarize the use of graphics in R.
CO4.Compare the different statistical models in R.
CO5.Demonstrate the use of advanced concepts in R

REFERENCE BOOKS:

R1-Jared P Lander R for Everyone, Kindle Edition, 2014.
R2-Grolemund and Garrett Hands-On Programming with R, Kindle Edition, 2014.
R3-Mark Gardener Beginning R: The Statistical Programming Language, 2013.
R4-Norman Matloff, The Art of R Programming-A Tour of Statistical Software Design, 2011.
R5-Richard F. Gilberg, and Behrouz A. Forouzan, Data Structures-A Pseudocode Approach with C, Thomson 2009
R6-John E.Hopcroft, Rajeev Motwani and Jeffrey.D Ullman, Introduction to Automata Theory, Languages and Computations, Pearson Education,3rd Edition, 2009.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS8306	DATABASE TUNING	3	0	0	3

Course Objective

1. To help you tune your application on your database management system, operating system, and hardware.
2. To teach you the principles underlying any tuning puzzle
3. To study real time processing of work load sharing
4. To apply tuning tools and troubleshoot the various DBMS queries
5. To tune to data warehouse and CRM applications

Unit	Description	Instructional Hours
I	**CONCURRENCY CONTROL AND RECOVERY** Review of Relational Databases – Locking and Concurrency Control — Logging and the Recovery Subsystem — Operating Systems Considerations – Hardware Tuning.	9
II	**INDEX TUNING AND NORMALIZATION** Types of Queries – Data Structures – Clustering Indexes – Non Clustering Indexes – Composite Indexes – Hot Tables – Tuning Relational Systems – Normalization – Clustering Two Tables – Aggregate Maintenance – Record Layout- Query Tuning – Triggers	9
III	**REAL TIME DATABASES** Client Server Mechanisms – Objects, Application Tools and Performance – Tuning the Application Interface – Bulk Loading Data – Accessing Multiple Databases - Real- time databases – transaction chopping – optimal Chopping algorithm – Understanding Access plans case study	9
IV	**TROUBLESHOOTING** Consumption chain approach-Query Plan Explainers – Performance Monitors – Event Monitors – Finding "Suspicious" Queries – Analyzing a Query's Access Plan – Profiling a Query Execution – DBMS Subsystems - Checking DBMS resources	9
V	**TUNING DATAWAREHOUSE AND E-COMMERCE APPLICATIONS** Data Warehouse Tuning– Tuning for CRM Systems – Federated Data Warehouse Tuning -E-commerce architecture- Tuning e-commerce architecture – Capacity planning - Case study .	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1:Understanding the recovery system and security of Database system
CO2:Analyze normalization and tuning for various data formats
CO3:Exposure to real time tuning process
CO4:Study various querying methods and improvements in tuning
CO5:Knowledge about application that used for tuning database systems

TEXT BOOK

T1 - Dennis Shasha and Philippe Bonnet, "Database Tuning, Principles, Experiments, and Troubleshooting Techniques", Morgan Kaufmann, An Imprint of Elsevier, 2003.

REFERENCES

R1 - Thomas Connoly and Carlolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Third Edition, Pearson Education, 2003.
R2 - Tamer M. Ozsu , Patrick Ualduriel, "Principles of Distributed Database Systems", Second Edition, Pearson Education, 2003.
R3 - Margaret H. Dunham, S. Sridhar "Data Mining Introductory & Advance Topics", PHI, 2002.
R4 - http://www.cs.helsinki.fi/u/laine/tikape/k03/material03.html
R5 - http://infolab.stanford.edu/~ullman/dscb.html
R6 - http://cs.nyu.edu/courses/spring06/G22.2433-001/
R7 - http://www.doc.ic.ac.uk/~pjm/adb/index.html
R8 - http://www.cs.manchester.ac.uk/postgraduate/taught/programmes / fulllist/

ELECTIVE- VI

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS8307	VISUAL PROGRAMMING	3	0	0	3

Course Objective

1. To Learn the Basics of Windows Programming
2. To Design applications using Visual Basic
3. To Design applications using Visual C++ Programming
4. To Learn the visual C++ menus and SDI MDI environments
5. To Study the applications of Visual C++Programming

Unit	Description	Instructional Hours
I	**INTRODUCTION TO WINDOWS PROGRAMMING** GUI Concepts – Overview of Windows programming – Creating the window – Displaying the window - message Loop – windows procedure-WM_PAINT message - WM_DESTROY message – An Introduction to GDI –- device context – basic drawing – Text output Scroll Bars –Keyboard – Mouse – Menus.	9
II	**VISUAL BASIC PROGRAMMING** IDE – First Visual Basic Program - Introduction to Forms – Control statements – control arrays – Creating and using Controls – Menus and Dialogs- Intrinsic Controls – Objects and instances – Debugging – Responding to mouse events – Drag and Drag drop events- Responding to keyboard events - working with Files - Accessing databases with data control - Classes and Objects – ADO Object Model.	9
III	**VISUAL C++ PROGRAMMING** Visual C++ components – Introduction to Microsoft foundation classes Library Application Framework – Getting Started with AppWizard – Basic Event handling, Mapping modes, and a Scrolling View - Graphics Device Interface, Colors and fonts – modal and modeless dialog – windows common controls – bitmaps	9
IV	**THE DOCUMENT AND VIEW ARCHITECTURE** Menus – Keyboard Accelerators – Rich Edit Control – Tool bars – Status bars – A reusable Frame Window Base Class - Reading and writing documents - SDI and MDI environments – splitter windows and multiple views.	9
V	**APPLICATIONS OF VISUAL PROGRAMMING** Dynamic link library – ActiveX controls Vs. Ordinary Windows Controls – Installing ActiveX controls – Calendar Control – ActiveX control container programming – create ActiveX control at runtime -Component Object Model - Object linking and embedding – Data Base Management with Microsoft ODBC- Threading.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: To Understand the Basics of Windows Programming
CO2:To Develop applications using Visual Basic
CO3:To Develop applications using Visual C++ Programming
CO4:To Understand the visual C++ menus and SDI MDI environments
CO5:To develop the applications of Visual C++Programming

TEXT BOOKS:

T1 - Charles Petzold, "Windows Programming", Microsoft press, 1998.
T2 - Francesco Balena, "Programming Microsoft Visual Basic6.0", Microsoft press, Indian Reprint, 2001.
T3 - David Kruglirski.J, "Programming Microsoft Visual C++", Fifth Edition, Microsoft press, 1998.

REFERENCE BOOKS :

R1 - Visual C++ 6 From the grounded up , 2nd Edition by John Mueller, McGraw – HILL INTERNATIONAL EDITION, Indian Reprint, 2008.
R2 - Visual Basic 6.0 Programming, Content Development Group, Tata McGraw-Hill Publishing Company Limited, Indian Reprint, 2008.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS8308	SOFTWARE TESTING	3	0	0	3

Course Objective

1. To learn virtual reality concepts
2.To analyze geometric modeling transformations
3.To understand Virtual environment
4.To learn about Virtual Hardwares and Softwares
5.To implement Virtual Reality applications

Unit	Description	Instructional Hours
I	**SOFTWARE TESTING FUNDAMENTALS** Testing as an Engineering Activity - Role of Process in Software Quality - Testing as a Process- The six essentials of software testing - Basic Definitions: Software Testing Principles - The role of a software tester - Origins of Defects- Defect Classes the Defect Repository	9
II	**TESTING DESIGN STRATEGIES** Introduction to Testing Design Strategies - The Smarter Tester - Test Case Design Strategies - Black Box testing - Random Testing - Equivalence Class Partitioning - Boundary Value Analysis - Cause and error graphing and state transition testing - Error Guessing - Black-box testing and COTS - White-Box testing - Test Adequacy Criteria - Coverage and Control Flow Graphs.	9
III	**LEVELS OF TESTING** The Need for Levels of Testing- Unit Test - Unit Test Planning- Designing the Unit Tests. The Class as a Testable Unit - The Test Harness - Running the Unit tests and Recording results- Integration tests- Designing Integration Tests - Integration Test Planning - System Test - Types-of system testing - Regression Testing.	9
IV	**TEST MANAGEMENT** People and organizational issues in testing - organization structures for testing teams - testing services - Test Planning - Test Plan Components - Test Plan Attachments - Locating Test Items - test management - test process - 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.	9
V	**TEST MEASUREMENTS AND REVIEWS** Defining Terms - Measurements and Milestones for Controlling and Monitoring- Status Meetings- Reports and Control Issues - Criteria for Test Completion- SCM - Types of reviews - developing a review program - Components of Review Plans- Reporting review results. Testing Tools-Case Selenium, Autoit	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Explore the fundamentals and activities in software testing.
CO2: Explain the various test design strategies.
CO3: Elucidate the levels of testing and defect classes.
CO4: Analyze the techniques in test management.
CO5: Implement the testing and debugging policies with the types of review.

TEXT BOOKS:

T1 - 1.John Vince, “Virtual Reality Systems “, Pearson Education Asia, 2007.

REFERENCE BOOKS :

R1 - 1.Adams, “Visualizations of Virtual Reality”, Tata McGraw Hill, 2000.
R2 - Grigore C. Burdea, Philippe Coiffet , “Virtual Reality Technology ”, Wiley Interscience, 2nd Edition, 2006.
R3 - William R. Sherman, Alan B. Craig, “ Understanding Virtual Reality: Interface, Application, and Design”, Morgan Kaufmann, 2008.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS8309	HIGH PERFORMANCE COMPUTING	3	0	0	3

Course Objective

1. To learn about Modern Processors and concepts
2. To understand the concepts of Optimizations
3. To learn about Parallel Computers and Programming
4. To study about Memory Parallel Programming using Open MP and MPI
5. To understand the point-to-point communication

Unit	Description	Instructional Hours
I	**MODERN PROCESSORS** Stored Program Computer Architecture- General purpose cache-based microprocessor-Performance based metrics and benchmarks-Moore's Law-Pipelining-Superscalarity-SIMDMemory Hierarchies Cache- mapping-prefetch-Multicore processors-Mutithreaded processors- Vector Processors-Design Principles-Maximum performance estimates- Programming for vector architecture.	9
II	**BASIC OPTIMIZATION TECHNIQUES FOR SERIAL CODE** Scalar profiling- Function and line based runtime profiling- Hardware performance counters-Common sense optimizations-Simple measures, large impact-Elimination of common subexpressions- Avoiding branches- Using SIMD instruction sets- The role of compilers-General optimization options-Inlining-Aliasing- Computational Accuracy- Register optimizations- Using compiler logs-C++ optimizations-Temporaries-Dynamic memory management- Loop kernels and iterators Data Access Optimization: Balance analysis and lightspeed estimates- Storage order- Case study: Jacobi algorithm and Dense matrix transpose.	9
III	**PARALLEL COMPUTERS** Taxonomy of parallel computing paradigms- Shared memory computers- Cache coherance- UMA-ccNUMA-Distributed-memory computers- Hierarchical systems-Networks-Basic performance characteristics- Buses- Switched and fattree networks- Mesh networks- Hybrids Basics of parallelization - Why parallelize - Data Parallelism - Function Parallelism-Parallel Scalability-Factors that limit parallel execution- Scalability metrics-Simple scalability laws- parallel efficiency - serial performance Vs Strong scalability- Refined performance models- Choosing the right scaling baseline.Case Study : Can slow processors compute faster- Load balance.	9
IV	**SHARED MEMORY PARALLEL PROGRAMMING WITH OPENMP** Introduction to OpenMP - Parallel execution - Data scoping- OpenMP work sharing for loops-Synchronization-Reductions-Loop Scheduling - Tasking -Case Study: OpenMP- parallel Jacobi algorithm- Advanced OpenMP wavefront parallelization- Efficient OpenMP rogramming: Profiling OpenMP programs -Performance pitfalls- Case study: Parale Sparse matrix-vector multiply.	9
V	**DISTRIBUTED-MEMORY PARALLEL PROGRAMMING WITH MPI** Message passing - Introduction to MPI- Example- Messages and point-to-point communication-Collective communication- Nonblocking point-to-point communication- Virtual topologies - MPI parallelization of Jacobi solver-MPI implementation-performance properties Efficient MPI programming: MPI performance tools- communication parameters-Synchronization, serialization, contention- Reducing communication overhead optimal domain decomposition- Aggregating messages - Nonblocking Vs Asynchronous communication- Collective communication-Understanding intra node point-to-point communication.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Identify the Modern Processors and concepts
CO2: Discuss the various concepts of Optimizations
CO3: Analyze the parallel computers and programming
CO4: Analyze about Memory Parallel Programming using Open MP and MPI.
CO5: Identify the point-to-point communication.

TEXT BOOKS:

T1 - Georg Hager, Gerhard Wellein, "Introduction to High Performance Computing for Scientists and Engineers", Chapman & Hall / CRC Computational Science series, 2011.

REFERENCE BOOKS :

R1 - Charles Severance, Kevin Dowd, "High Performance Computing", O'Reilly Media, 2nd Edition, 1998.
R2 - Kai Hwang, Faye Alaye Briggs, "Computer Architecture and Parallel Processing", McGraw Hill, 1984.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS8310	MANAGEMENT INFORMATION SYSTEMS	3	0	0	3

Course Objective

1. Gain knowledge about the major types of information systems used in a business environment.
2. Impart knowledge on the ethical issues of information systems.
3. Impart knowledge on the social issues of information systems
4. Impart knowledge on the security issues of information systems
5. Understand the processes of developing and implementing information systems.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO INFORMATION SYSTEMS** Information Systems in Global Business Today: Role of Information Systems in Business Today - Perspectives of Information Systems - Approaches to Information Systems - Global E-Business and Collaboration: Business Process and Information Systems - Types of Information Systems Enterprise Systems	9
II	**INFORMATION TECHNOLOGY INFRASTRUCTURE** Information Systems, Organizations and Strategy: Organizations and Information Systems - Impact of Information Systems on organizations and Business Firms - Ethical and Social Issues in Information Systems: Understanding Ethical and Social Issues Related to Systems - Ethics in an information society - IT Infrastructure and Emerging Technologies: Infrastructure Components - Hardware Platform Trends - Software Platform Trends	9
III	**DATABASES AND INFORMATION MANAGEMENT** Organizing Data in Traditional File Environment - Database Approach to Data Management – Using Databases to improve Business Performance and Decision Making - Managing Data Resources	9
IV	**NETWORKS AND SECURITY** Telecommunications and Networking in todays Business Needs: Networking and Communication Trends - Key Digital Networking Technologies - Securing Information Systems: System Vulnerability – Business Value of Security and Control - Establishing Management Framework for Security and Control - Technologies and Tools for Protecting Information Resources.	9
V	**NEW IT INITIATIVES** Enterprise Applications: Enterprise Systems - Supply Chain Management Systems – Customer Relationship Management Systems - Electronic Commerce: Types of Electronic Commerce – Mcommerce Services and Applications - The Knowledge Management Landscape: Important Dimensions of Knowledge - The Knowledge Management Value Chain - Types of Knowledge Management Systems.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Understand the basics of Management Information systems.
CO2: Formulate solutions social and ethical issues related to information technology infrastructure.
CO3: Apply the knowledge on database management systems to store hybrid information in a business organization.
CO4:Recognize the use of security mechanisms to share business information over various types of networks.
CO5:Explore the new IT initiatives for enhancing knowledge management information systems.

REFERENCE BOOKS:

R1- Kenneth C. Laudon, Jane P. Laudon, Management Information Systems -Managing the digital firm, Pearson Education, 2012.
R2- Waman S Jawadekar, Management Information Systems-Texts and Cases, the McGraw-Hill Company, 2009.
R3- James O' Brien, Management Information Systems-Managing Information Technology in the Ebusiness enterprise, McGraw-Hill Higher Education, 2011.
R4- Turban, McLean and Wether, Information Technology for Management-Transforming Organisations in the Digital Economy, John Wiley, 2008.
R5- Raymond McLeod and Jr. George P. Schell, Management Information Systems, Pearson Education, 2008.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
BE	16CS8311	ENGINEERING ECONOMICS	3	0	0	3

Course Objective

1. Provide the theoretical foundations in micro and macro analysis in terms of concepts and theories
2. Learn the functions of demand and supply
3. Emphasis the systematic evaluation of the costs and benefits associated with projects.
4. Understand about the market structure
5. Learn about financial Accounting

Unit	Description	Instructional Hours
I	**INTRODUCTION** Introduction to Micro and Macro economics-Kinds of Economic Systems-Production Possibility Frontier-Opportunity Cost-Objective of Organizations-Kinds of Organization.	9
II	**DEMAND AND SUPPLY** Functions of Demand and Supply -Law of diminishing Marginal Utility Law of Demand and Supply -Elasticity of Demand -Demand Forecasting Methods-Indifference curve	9
III	**PRODUCTION AND COST** Production Function-Returns to Scale-Law of Variable Proportion-Cost and Revenue concepts and Cost Curves-Revenue curves-Economies and Dis-economies of scale-Break Even point	9
IV	**MARKET STRUCTURE** Market Structure-Perfect Competition-Monopoly-Monopolistic-Oligopoly-Components of Pricing-Methods of Pricing-Capital Budgeting IRR-ARR-NPV-Return on Investment-Payback Period	9
V	**INTRODUCTION TO MACRO ECONOMICS AND FINANCIAL ACCOUNTING** National Income-Calculation Methods-Problems-Inflation-Deflation-Business Cycle-Taxes-Direct and Indirect Taxes -Fiscal and monetary policies	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Understand the micro economic environment for creating a favorable business environment.
CO2:Take decision by making use of the major concepts and techniques of engineering economic analysis.
CO3: Compare the cost of multiple projects by using the methods learned, and make a quantitative decision between alternate facilities and/or systems.
CO4:Apply the appropriate engineering economics analysis method(s) for problem solving: present worth, annual cost, rate-of-return, payback, break-even, benefit-cost ratio.
CO5:Examine and evaluate the issues in macro-economic analysis.

REFERENCE BOOKS:

R1-A Ramachandra Aryasri and V V RamanaMurthy, Engineering Economics and Financial Accounting, Tata McGraw Hill Publishing Company Limited, New Delhi, 2006.
R2-V L Samuel Paul and G S Gupta, Managerial Economics Concepts and Cases, Tata McGraw Hill Publishing Company Limited, New Delhi, 1981.
R3.-R Kesavan, C Elanchezhian and T Sunder Selwyn, Engineering Economics and Financial Accounting, Laxmi Publication Ltd, New Delhi, 2005.
R4-S N Maheswari, Financial and Management Accounting, Sultan Chand
R5.V L Samuel Paul and G S Gupta, Managerial Economics-Concepts and Cases

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS8312	BIG DATA ANALYTICS	3	0	0	3

Course Objective

1. To understand the basics of data analytics.
2. To Learn the Business Intelligence and its Framework.
3. To understand the technologies for big data analytics.
4. To Learn Hadoop and HDFS
5. To Learn Business implementation for real time data

Unit	Description	Instructional Hours
I	**INTRODUCTION TO DATA ANALYTICS** Data and Relations, Data Visualization, Correlation, Regression, Forecasting, Classification, Clustering. Big Data Technology Landscape: Fundamentals of Big Data Types, Big data Technology Components, Big Data Architecture, Big Data Warehouses, Functional vs. Procedural Programming Models for Big Data.	9
II	**INTRODUCTION TO BUSINESS INTELLIGENCE** Business View of IT Applications, Digital Data, OLTP vs. OLAP, Why, What and How BI? , BI Framework and components, BI Project Life Cycle, Business Intelligence vs. Business Analytics.	9
III	**BIG DATA ANALYTICS** Big Data Analytics, Framework for Big Data Analysis, Approaches for Analysis of Big Data, ETL in Big Data, Introduction to Hadoop Ecosystem, HDFS, Map-Reduce Programming, Understanding Text Analytics and Big Data, Predictive analysis on Big Data, Role of Data analyst.	9
IV	**BUSINESS IMPLEMENTATION OF BIG DATA** Big Data Implementation, Big Data workflow, Operational Databases, Graph Databases in a Big Data Environment, Real-Time Data Streams and Complex Event Processing, Applying Big Data in a business scenario, Security and Governance for Big Data.	9
V	**BIG DATA ON CLOUD** Big Data on Cloud, Best practices in Big Data implementation, Latest trends in Big Data, Latest trends in Big Data, Big Data Computation, More on Big Data Storage, Big Data Computational Limitations. Introduction to most recent advancements in Big Data technology along with their usage and implementation with relevant tools and technologies.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Analyze basics of data analytics and big data technology
CO2: Design the Business Intelligence and its Framework.
CO3: Implement the big data analysis using Hadoop
CO4: Understand the HDFS concepts
CO5: Able to apply the analytics techniques on a variety of applications.

TEXT BOOKS:

T1 - Michael Minelli, Michele Chambers, AmbigaDhiraj, Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley CIO Series (2013), First Edition.

REFERENCE BOOKS :

R1 - T. white, Hadoop: The Definitive Guide, O' Reilly Media (2012), Third Edition.
R2 - Data-Intensive Text Processing with MapReduce. Jimmy Lin and Chris Dyer. Morgan & Claypool Publishers, 2010.

OPEN ELECTIVES

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS6401	PROGRAMMING LANGUAGES	3	0	0	3

Course Objective

1. Familiarize the concepts of programming languages.
2. Build an understanding of the fundamental concepts of C programming
3. Introduce the concepts of object oriented programming language
4. Understand the concepts of web development language – java programming
5. Allow the students to gain expertise in the basic features of .Net and develop the application using .net

Unit	Description	Instructional Hours
I	**PROGRAMMING LANGUAGES OVERVIEW** Introduction to computer programming – Algorithm – Pseudocode – Source Code – Flowchart – History of programming languages – Generations of Programming languages – Machine Level Language – Low Level Language – High Level Language- Compiler – Classification of programming language – Software development languages – Web development languages – Debugger	8
II	**C PROGRAMMING** Fundamentals of C programming – Structure of a C Program – Arrays: One Dimensional Array, Two Dimensional Array – Stings: String Library Functions. Function – Call by value, Call by reference. Pointers: Pointers and arrays.	8
III	**OBJECT ORIENTED PROGRAMMING FUNDAMENTALS** C++ Programming Features – Polymorphism: Compile Time Polymorphism and Run Time Polymorphism – Inheritance : Virtual functions – File handling concepts	9
IV	**JAVA PROGRAMMING** An overview of Java – Exception handling: Uncaught exception – using Try Catch – Multiple Catch – Nested try- Built in Exceptions – Introduction to Threads- Multithreading – Applets: Applet architecture – Skeleton – Simple Applet Display Methods – HTML Applet tag.	10
V	**C# AND .NET FRAMEWORK** .Net Overview - Overview of C# - Object oriented aspects of C# - Application development on .Net: Build windows application – Accessing data with ADO.Net	10
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: To be independently understanding the basic concepts of programming languages.
CO2: Understand the concepts of arrays and functions in C Programming.
CO3: Master the concepts of structured programming language OOPS.
CO4: Familiar with Java programming with the basic concepts and applets.
CO5: Understand the importance of C# and develop the windows based application.

REFERENCE BOOKS :

R1-Introduction to Computer Programming - http://cevre.beun.edu.tr/zeydan/pdf/introduction-to-computer-programming.pdf
R2-Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Pearson Education, 1988.
R3 - Bjarne Stroustrup, "The C++ Programming Language", 3rd Edition, Pearson Education, 2007.
R4 - D.Norton and H. Schildt, "Java 2 the complete Reference Fifth edition", TMH, 2002 (Re print 2009)
R5 - E. Balagurusamy, "Programming in C#", Tata McGraw-Hill, 2004.
R6- J. Liberty, "Programming C#", 2nd ed., O'Reilly, 2002.

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS7402	OPTIMIZATION TECHNIQUES	3	0	0	3

Course Objective

1. Introducing the basic concepts of Linear Programming
2. Educating on the advancements in Linear programming techniques
3. Introducing Non Linear programming techniques
4. Introducing the interior point methods of solving problems
5. Introducing the Dynamic programming method

Unit	Description	Instructional Hours
I	**LINEAR PROGRAMMING** Introduction - formulation of linear programming model-Graphical solution–solving LPP using simplex algorithm – Revised Simplex Method.	9
II	**ADVANCES IN LPP** Dualit theory- Dual simplex method - Sensitivity analysis–-Transportation problems– Assignment problems-Traveling sales man problem -Data Envelopment Analysis..	9
III	**NON LINEAR PROGRAMMING** Classification of Non Linear programming – Lagrange multiplier method – Karush – Kuhn Tucker conditions–Reduced gradient algorithms–Quadratic programming method – Penalty and Barrier method.	9
IV	**INTERIOR POINT METHODS** Karmarkar's algorithm–Projection Scaling method–Dual affine algorithm–Primal affine algorithm Barrier algorithm. .	9
V	**DYNAMIC PROGRAMMING** Formulation of Multi stage decision problem–Characteristics–Concept of sub-optimization and the principle of optimality–Formulation of Dynamic programming–Backward and Forward recursion–Computational procedure–Conversion offinal value problem in to Initial value problem. .	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Understand the ethical issues
CO2: Understand the environmental impact
CO3: Gain knowledge of management skills
CO4: To analyze the problems and find the optimized solution
CO5: Explain the principle of dynamic programming

TEXT BOOKS:

T1 - Hillier and Lieberman "Introduction to Operations Research", TMH, 2000.
T2 - R.Panneerselvam, "Operations Research", PHI, 2006.
T3 - Hamdy ATaha, "Operations Research –An Introduction", Prentice Hall India, 2003.

REFERENCE BOOKS :

R1 - Philips, Ravindran and Solberg, "Operations Research", John Wiley, 2002.
R2 - Ronald L.Rardin, "Optimization in Operation Research" Pearson Education Pvt. Ltd.New Delhi, 2005

Signature and Name of Chairman, BOS