CMR ENGINEERING COLLEGE
UGC AUTONOMOUS

Approved by AICTE-New Delhi | Affiliated to JNTUH | Accredited by NAAC & NBA

R22
CSE-DATA SCIENCE

AUTONOMOUS SYLLABUS

Course Structure and
Detailed Syllabus under Autonomous Status

BACHELOR OF TECHNOLOGY
(B.TECH.)
(CMREC – R-22 Regulations)

(Applicable for the batch admitted from 2022-2023)

PRELIMINARY DEFINITIONS AND NOMENCLATURES

- **AICTE:** Means All India Council for Technical Education, New Delhi.

- **Autonomous Institute:** Means an institute designated as Autonomous by University Grants Commission (UGC), New Delhi in concurrence with affiliating University (Jawaharlal NehruTechnological University, Hyderabad) and State Government of Telangana.

- **Academic Autonomy:** Means freedom to an institute in all aspects of conducting its academic programs, granted by UGC for Promoting Excellence.

- **Academic Council:** The Academic Council is the highest academic body of the institute and is responsible for the maintenance of standards of instruction, education and examination within the institute. Academic Council is an authority as per UGC regulations and it has the right to take decisions on all academic matters including academic research.

- **Academic Year:** It is the period necessary to complete an actual course of study within a year. It comprises two main semesters i.e., (one odd + one even) and supplementary semester.

- **Branch:** Means specialization in a program like B.Tech. Degree program in Electronics and communication Engineering, B.Tech degree program in Computer Science and Engineering, etc.

- **Board of Studies (BOS):** BOS is an authority as defined in UGC regulations, constituted by Head of the Organization for each of the departments separately. They are responsible for curriculum design and updation in respect of all the programs offered by a department.

- **Backlog Course:** A course is considered to be a backlog course, if the student has obtained a failure grade (F) in that course.

- **Basic Sciences:** The courses offered in the areas of Mathematics, Physics, Chemistry etc., are considered to be foundational in nature.

- **Commission:** Means University Grants Commission (UGC), New Delhi.

- **Choice Based Credit System:** The credit based semester system is one which provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching along with provision of choice for the student in the course selection.

- **Compulsory course:** Course required to be undertaken for the award of the degree as per the program.

- **Continuous Internal Examination:** It is an examination conducted towards sessional assessment.

- **Core:** The courses that are essential constituents of each engineering discipline are categorized as professional core courses for that discipline.

- **Course:** A course is a subject offered by a department for learning in a particular semester.

- **Course Outcomes:** The essential skills that need to be acquired by every student through a course.

- **Credit:** A credit is a unit that gives weight to the value, level or time requirements of an academic course. The number of 'Contact Hours' in a week of a particular course determines its credit value. One credit is equivalent to one lecture/tutorial/lab hour per week.

- **Credit point:** It is the product of grade point and number of credits for a course.

- **Cumulative Grade Point Average (CGPA):** It is a measure of cumulative performance of a student over all the completed semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

- **Curriculum:** Curriculum incorporates the planned interaction of students with instructional content, materials, resources, and processes for evaluating the attainment of Program Educational Objectives.

- **Department:** An academic entity that conducts relevant curricular and co-curricular activities, involving both teaching and non-teaching staff, and other resources in the process of study for a degree.

- **Dropping from Semester:** Student who does not want to register for any semester can apply in writing in prescribed format before the commencement of that semester.

- **Elective Course:** A course that can be chosen from a set of courses. An elective can be Professional Elective and or Open Elective.

- **Evaluation:** Evaluation is the process of judging the academic performance of the student in her/his courses. It is done through a combination of continuous internal assessment and semester end examinations.

- **Grade:** It is an index of the performance of the students in a said course. Grades are indicated by alphabets.

- **Grade Point:** It is a numerical weight allotted to each letter grade on a 10 - point scale.

- **Honors:** An Honors degree typically refers to a higher level of academic achievement at an undergraduate level.

- **Institute:** Means CMR Engineering, Hyderabad unless indicated otherwise by the context.

- **Massive Open Online Courses (MOOC):** MOOC courses inculcate the habit of self-learning. MOOC courses would be additional choices in all the elective group courses.

- **Minor:** Minor are coherent sequences of courses which may be taken in addition to the courses required for the B.Tech. Degree.

- **Pre-requisite:** A specific course or subject, the knowledge of which is required to complete before student register another course at the next grade level.

- **Professional Elective:** It indicates a course that is discipline centric. An appropriate choice of minimum number of such electives as specified in the program will lead to a degree with specialization.

- **Program:** Means, UG degree program: Bachelor of Technology (B.Tech.) and PG degree program: Master of Technology (M.Tech.).

- **Program Educational Objectives:** The broad career, professional and personal goals that every student will achieve through a strategic and sequential action plan.

- **Project work:** It is a design or research based work to be taken up by a student during his/her final year to achieve a particular aim. It is a credit based course and is to be planned carefully by the student.

- **Re-Appearing:** A student can reappear only in the semester end examination for theory component of a course, subject to the regulations contained herein.

- **Registration:** Process of enrolling into a set of courses in a semester of a program.

- **Regulations:** The regulations, common to all B.Tech. Programs offered by Institute, are designated as – CMREC Regulations – R-22 and are binding on all the stakeholders.

- **Semester:** It is a period of study consisting of 15 to 18 weeks of academic work equivalent to normally 90 working days. Odd semester commences usually in July and even semester in December of every year.

- **Semester End Examinations:** It is an examination conducted for all courses offered in a semester at the end of the semester.

- **Student Outcomes:** The essential skill sets that need to be acquired by every student during her/his program of study. These skill sets are in the areas of employability, entrepreneurial, social and behavioral.

- **University:** Means Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, is an affiliating University.

- **Withdraw from a Course:** Withdrawing from a course means that a student can drop from a course within the first two weeks of odd or even semester. However, he / she can choose a substitute course in place of it by exercising the option within 5 working days from the date of withdrawal.

FOREWORD

The autonomy is conferred to **CMR Engineering College (CMREC),** Hyderabad by University Grants Commission (UGC), New Delhi based on its performance as well as future commitment and competency to impart quality education. It is a mark of its ability to functionindependently in accordance with the set norms of the monitoring bodies including JNT University Hyderabad (JNTUH), Hyderabad and AICTE, New Delhi. It reflects the confidence of the affiliating University in the autonomous institution to uphold and maintain standards it expects to deliver on its own behalf. Thus, an autonomous institution is given the freedom to have its own **examination system** and **monitoring mechanism**, independent of the affiliating University but under its observance.

CMREC is proud to win the credence of all the above bodies monitoring the quality in education and has gladly accepted the responsibility of sustaining, if not improving upon the standards and ethics for which it has been striving for more than a decade in reaching its present standing in the arena of contemporary technical education. As a follow up, statutory bodies such as Academic Council and Board of Studies (BOS) are constituted with the guidance of the Governing Body of the institute and recommendations of the JNTUH toframe the regulations, course structure, and syllabi under autonomous status.

The autonomous regulations, course structure, and syllabi have been prepared after prolongedand detailed interaction with several expertise solicited from academics, industry and research, in accordance with the vision and mission of the institute in order to produce a quality engineering graduate to the society.

All the faculty, parents, and students are requested to go through all the rules and regulations carefully. Any clarifications needed are to be sought at appropriate time and from the principal of the institute, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The cooperation of all the stake holders is requested for the successful implementation of the autonomous system in the larger interests of the instituteand brighter prospects of engineering graduates.

PRINCIPAL

ACADEMIC REGULATIONS (R22) FOR B.TECH REGULAR STUDENTSWITH EFFECT FROM THE ACADEMIC YEAR 2022-23

1.0   U̲nder-G̲raduate Degree P̲rogramme in Engineering & Technology (UGP in E&T)

•   Jawaharlal Nehru Technological University Hyderabad (JNTUH) offers a 4-year (8 semesters) **Bachelor of Technology** (B.Tech.) degree programme, under Choice BasedCredit System (CBCS) at its non-autonomous constituent and affiliated colleges with effect from the academic year 2022-23.

2.0   Eligibility for Admission

2.1   Admission to the undergraduate (UG) programme shall be made either on the basis of the merit rank obtained by the qualified student in entrance test conducted by the Telangana State Government (EAMCET) or the University or on the basis of any otherorder of merit approved by the University, subject to reservations as prescribed by the government from time to time.

2.2   The medium of instructions for the entire undergraduate programme in Engineering & Technology will be **English** only.

3.0   B.Tech. Programme Structure

3.1   A student after securing admission shall complete the B.Tech. programme in a minimum period of four academic years (8 semesters), and a maximum period of eight academic years (16 semesters) starting from the date of commencement of first year first semester, failing which student shall forfeit seat in B.Tech course. Each student shall secure 160 credits (with CGPA $\geq$ 5) required for the completion of the undergraduate programme and award of the B.Tech. Degree.

3.2.   UGC/ AICTE specified definitions/ descriptions are adopted appropriately for various terms and abbreviations used in these academic regulations/ norms, which are listed below.

3.2.1 Semester Scheme

Each undergraduate programme is of 4 academic years (8 semesters) with the academicyear divided into two semesters of 22 weeks ($\geq$ 90 instructional days) each and in each semester - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)' under Choice Based Credit System (CBCS) and Credit Based Semester System(CBSS) indicated by UGC, and curriculum/course structure suggested by AICTE are followed.

3.2.2 Credit Courses

All subjects/ courses are to be registered by the student in a semester to earn credits which shall be assigned to each subject/ course in an L: T: P: C (lecture periods: tutorialperiods: practical periods: credits) structure based on the following general pattern.

•   One credit for one hour/ week/ semester for Theory/ Lecture (L) courses or Tutorials.

•   One credit for two hours/ week/ semester for Laboratory/ Practical (P) courses.

Courses like Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization Lab are mandatory courses. These courses will not carry any credits.

3.2.3 Subject Course Classification

All subjects/ courses offered for the undergraduate programme in E&T (B.Tech. degree programmes) are broadly classified as follows. The University has followed almost all the guidelines issued by AICTE/UGC.

S. No.	Broad Course Classification	Course Group/Category	Course Description
1	Foundation Courses (FnC)	BS – Basic Sciences	Includes Mathematics, Physics and Chemistry subjects
2		ES - Engineering Sciences	Includes Fundamental Engineering Subjects
3		HS – Humanities and Social Sciences	Includes subjects related to Humanities, Social Sciences and Management
4	Core Courses (CoC)	PC – Professional Core	Includes core subjects related to the parent discipline/ department/ branch of Engineering.
5	ElectiveCours-es(EℓC)	PE – Professional Electives	Includes elective subjects related to the parent discipline/ department/ branch of Engineering.
6		OE – Open Electives	Elective subjects which include inter- disciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering.
7	Core Courses	Project Work	B.Tech. Project or UG Project or UG Major Project or Project Stage I & II
8		Industry Training/ Internship/ Industry Oriented Mini-	Industry Training/ Internship/ Industry Oriented Mini-Project/ Mini-Project/ Skill Development Courses
9		project/ Mini- Project/ Skill Development Courses	
		Seminar	Seminar/ Colloquium based on core contents related to parent discipline/ department/ branch of Engineering.
10	Minor Courses	-	1 or 2 Credit Courses (subset of HS)
11	Mandatory Courses (MC)	-	Mandatory Courses (non-credit)

4.0   Course Registration

4.1.   A 'faculty advisor or counselor' shall be assigned to a group of 20 students, who will advise the students about the undergraduate programme, its course structure and curriculum, choice/option for subjects/ courses, based on their competence, progress, pre-requisites and interest.

4.2.   The academic section of the college invites 'registration forms' from students before the beginning of the semester through 'on-line registration', ensuring 'date and time stamping'. The online registration requests for any 'current semester' shall be **completed before the commencement of SEEs (Semester End Examinations) of the 'preceding semester'**.

4.3   A student can apply for **on-line** registration, **only after** obtaining the '**written approval**' from faculty advisor/counselor, which should be submitted to the college academic section through the Head of the Department. A copy of it shall be retained with the Head of the Department, Faculty Advisor/ Counselor and the student.

4.4   A student may be permitted to register for all the subjects/ courses in a semester as specified in the course structure with maximum additional subject(s)/course(s) limited to 6 Credits (any 2 elective subjects), based on **progress** and SGPA/ CGPA, and completion of the '**pre-requisites**' as indicated for various subjects/ courses, in the department course structure and syllabus contents.

4.5   Choice for '**additional subjects/courses**', not more than any 2 elective subjects in any Semester, must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor/Mentor/HOD.

4.6   If the student submits ambiguous choices or multiple options or erroneous entries during **online** registration for the subject(s) / course(s) under a given/ specified course group/ category as listed in the course structure, only the first mentioned subject/ course in that category will be taken into consideration.

4.7.   Subject/ course options exercised through **on-line** registration are final and **cannot** be changed or inter-changed; further, alternate choices also will not be considered. However, if the subject/ course that has already been listed for registration by the Head of the Department in a semester could not be offered due to any inevitable or unexpected reasons, then the student shall be allowed to have alternate choice either for a new subject (subject to offering of such a subject), or for another existing subject (subject to availability of seats). Such alternate arrangements will be made by the Head of the Department, with due notification and time-framed schedule, within **a week** after the commencement of class-work for that semester.

4.8.   Dropping of subjects/ courses may be permitted, only after obtaining prior approval from the faculty advisor/ counselor 'within a period of 15 days' from the beginning of the current semester.

4.9   **Open Electives**: The students have to choose three Open Electives (OE-I, II & III) from the list of Open Electives given by other departments. However, the student can opt for an Open Elective subject offered by his own (parent) department, if the student has not registered and not studied that subject under any category (Professional Core, Professional Electives, Mandatory Courses etc.) offered by parent department in any semester. Open Elective subjects already studied should not repeat/should not match with any category (Professional Core, Professional Electives, Mandatory Courses etc.) of subjects even in the forthcoming semesters.

4.10. **Professional Electives**: The students have to choose six Professional Electives (PE-I to VI) from the list of professional electives given.

5.0   Subjects/ courses to be offered

5.1.   A subject/ course may be offered to the students, **only if** a minimum of 15 students opt for it.

5.2.   More than **one faculty member** may offer the **same subject** (lab/ practical may be included with the corresponding theory subject in the same semester) in any semester. However, selection of choice for students will be based on - '**first come first serve** basis and CGPA criterion' (i.e. the first focus shall be on early **on-line entry** from the student for registration in that semester, and the second focus, if needed, will be on CGPA of the student).

5.3.   If more entries for registration of a subject come into picture, then the Head of the Department concerned shall decide, whether or not to offer such a subject/ course for **two (or multiple) sections**.

5.4.   In case of options coming from students of other departments/ branches/ disciplines (not considering **open electives**), first **priority** shall be given to the student of the '**parent department**'.

6.0   Attendance requirements:

6.1.   A student shall be eligible to appear for the semester end examinations, if the student acquires a minimum of 75% of attendance in aggregate of all the subjects/ courses (including attendance in mandatory courses like Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization Lab) for that semester.**Two periods** of attendance for each theory subject shall be considered, if the student

Appears for the mid-term examination of that subject. **This attendance should also be included in the attendance uploaded every fortnight in the University Website.**

6.2.   Shortage of attendance in aggregate upto 10% (65% and above, and below 75%) in each semester may be condoned by the college academic committee on genuine and valid grounds, based on the student's representation with supporting evidence.

6.3.   A stipulated fee shall be payable for condoning of shortage of attendance.

6.4.   Shortage of attendance below 65% in aggregate shall in **NO** case be condoned.

6.5.   **Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester. They get detained and their registration for that semester shall stand cancelled,** including all academic credentials (internal marks etc.) of that semester. **They will not be promoted to the next semester**. They may seek re-registration for all those subjects registered in that semester in which the student is detained, by seeking re-admission into that semester asand when offered; if there are any professional electives and/ or open electives, the same may also be re-registered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the **same** set of elective subjects offered under that category.

6.6.   A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class.

7.0   Academic Requirements

The following academic requirements have to be satisfied, in addition to the attendancerequirements mentioned in Item No. **6**.

7.1.   A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course, if student secures not less than 35% (14 marks out of 40 marks) in the Continuous Internal Evaluation (CIE), not less than 35% (21 marks out of 60 marks) in the semester end examinations (SEE), and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing '**C**' grade or above in that subject/ course.

7.2   A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Real-time Research Project (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship (or) Seminar, if the student secures not less than 40% marks (i.e. 40 out of 100 allotted marks) in each of them. The student isdeemed to have failed, if he (i) does not submit a report on Industry Oriented Mini Project/Internship, or (ii) not make a presentation of the same before the evaluation committee as per schedule, or (iii) secures less than 40% marks in Real-time Research Project (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship evaluations.

A student may reappear once for each of the above evaluations, when they are scheduled again; if the student fails in such 'one reappearance' evaluation also, the student has to reappear for the same in the next subsequent semester, as and when it isscheduled.

7.3   Promotion Rules:

S. No.	Promotion	Conditions to be fulfilled
1	First year first semester to first year second semester	Regular course of study of first year first semester.
2	First year second semester toSecond year first semester	Regular course of study of first yearsecond semester. Must have secured at least 20 credits outof 40 credits i.e., 50% credits up to first yearsecond semester from all the relevantregular and supplementary examinations, whether the student takes thoseexaminations or not.
3.	Second year first semester toSecond year second semester	Regular course of study of second year first semester.
4	Second year second semesterto Third year first semester	Regular course of study of second year second semester. Must have secured at least 48 credits outof 80 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes thoseexaminations or not.

5	Third year first semester to Third year second semester	Regular course of study of third year first semester.
6	Third year second semesterto Fourth year first semester	Regular course of study of third year second semester. Must have secured at least 72 credits outof 120 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes thoseexaminations or not.
7	Fourth year first semester to Fourth year second semester	Regular course of study of fourth year first semester.

7.4. A student (i) shall register for all courses/subjects covering 160 credits as specified and listed in the course structure, (ii) fulfills all the attendance and academic requirements for 160 credits, (iii) earn all 160 credits by securing SGPA $\geq$ 5.0 (in each semester), andCGPA $\geq$ 5 (at the end of 8 semesters), (iv) **passes all the mandatory courses,** to successfully complete the undergraduate programme. The performance of the student in these 160 credits shall be considered for the calculation of the final CGPA **(at the end of undergraduate programme),** and shall be indicated in the grade card / marks memo of IV-year II semester.

7.5. If a student registers for '**extra subjects'** (in the parent department or other departments/ branches of Engg.) other than those listed subjects totaling to 160 credits as specified in the course structure of his department, the performances in those '**extrasubjects**' (although evaluated and graded using the same procedure as that of the required 160 credits) will not be considered while calculating the SGPA and CGPA. For such '**extra subjects'** registered, percentage of marks and letter grade alone will beindicated in the grade card / marks memo as a performance measure, subject to completion of the attendance and academic requirements as stated in regulations Items6 and 7.1 − 7.4 above.

7.6. A student eligible to appear in the semester end examination for any subject/ course, but absent from it or failed (thereby failing to secure **'C'** grade or above) may reappearfor that subject/ course in the supplementary examination as and when conducted. In such cases, internal marks (CIE) assessed earlier for that subject/ course will be carriedover, and added to the marks to be obtained in the SEE supplementary examination forevaluating performance in that subject.

7.7. A student **detained in a semester due to shortage of attendance may be re-admitted in the same semester in the next academic year for fulfillment of academic requirements**. The academic regulations under which a student has been re-admitted shall be applicable. Further, no grade allotments or SGPA/ CGPA calculations will be done for the entire semester in which the student has been detained.

7.8 A student detained **due to lack of credits, shall be promoted to the next academic year only after acquiring the required number of academic credits.** The academic regulations under which the student has been readmitted shall be applicable to him.

8.0 Evaluation - Distribution and Weightage of Marks

8.1 The performance of a student in every subject/course (including practical's and Project

Stage – I & II) will be evaluated for 100 marks each, with 40 marks allotted for CIE (Continuous Internal Evaluation) and 60 marks for SEE (Semester End-Examination).

8.2. In CIE, for theory subjects, during a semester, there shall be two mid-term examinations. Each Mid-Term examination consists of two parts i) **Part – A** for 10 marks, ii) **Part – B** for 20 marks with a total duration of 2 hours as follows:

1. Mid Term Examination for 30 marks:

   a. Part - A : Objective/quiz paper/Short Answers for 10 marks.(5*2=10Marks)

   b. Part - B : Descriptive paper for 20 marks.

The objective/quiz paper is set with multiple choice, fill-in the blanks and match the following type of questions for a total of 10 marks. The descriptive paper shall contain6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks. The **average of the two Mid Term Examinations** shall be taken as the final marks for Mid Term Examination (for 30 marks).

1. The remaining 10 marks of Continuous Internal Evaluation are distributed as:

2. Assignment for 5 marks. (**Average of 2 Assignments** each for 5 marks)

3. Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in theconcerned subject for 5 marks.

- While the first mid-term examination shall be conducted on 50% of the syllabus, the second mid-term examination shall be conducted on the remaining 50% of the syllabus.

- Five (5) marks are allocated for assignments (as specified by the subject teacher concerned). The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination. The average of the two assignments shallbe taken as the final marks for assignment (for 5 marks).

- Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the subject concerned for 5 marks before II Mid-Term Examination.

- The Student, in each subject, shall have to earn 35% of marks (i.e. 14 marks out of 40 marks) in CIE, 35% of marks (i.e. 21 marks out of 60) in SEE and Overall 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together.

- *The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 35% (14 marks) of 40 Continuous Internal Examination (CIE) marks.*

- *In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.*

There is NO Computer Based Test (CBT) for R22 regulations.

- The details of the end semester question paper pattern are as follows:

8.2.1. The semester end examinations (SEE), for theory subjects, will be conducted for 60marks consisting of two parts viz. i) **Part- A** for 10 marks, ii) **Part - B** for 50 marks.

- Part-A is a compulsory question which consists of ten sub-questions from all

unitscarrying equal marks.

- Part-B consists of five questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from each unit and may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be twoquestions from each unit and the student should answer either of the two questions.

- The duration of Semester End Examination is 3 hours.

8.3 For practical subjects there shall be a Continuous Internal Evaluation (CIE) during the semester for 40 marks and 60 marks for semester end examination. Out of the 40 marks for internal evaluation:

1. A write-up on day-to-day experiment in the laboratory (in terms of aim, components/ procedure, expected outcome) which shall be evaluated for 10 marks

2. **10 marks for viva-voce (**or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.

3. Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 10 marks.

4. The remaining 10 marks are for Laboratory Project, which consists of the Design (or) Software / Hardware Model Presentation (or) App Development (or) PrototypePresentation submission which shall be evaluated after completion of laboratory course and before semester end practical examination.

- The Semester End Examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed from the cluster / other colleges which will be decided by the examination branch of the University.

- In the Semester End Examination held for 3 hours, total 60 marks are divided and allocated as shown below:

1. 10 marks for write-up

2. 15 for experiment/program

3. 15 for evaluation of results

4. 10 marks for presentation on another experiment/program in the samelaboratory course and

5. 10 marks for viva-voce on concerned laboratory course.

- The Student, in each subject, shall have to earn 35% of marks (i.e. 14 marks out of 40 marks) in CIE, 35% of marks (i.e. 21 marks out of 60) in SEE and Overall 40%of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together.

- The student is eligible to write Semester End Examination of the concerned subject, if the student scores $\geq$ 35% (14 marks) of 40 Continuous Internal Examination (CIE) marks.

- In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.

8.4   There shall be an Industry training (or) Internship (or) Industry oriented Mini-project (or) Skill Development Courses (or) Paper presentation in reputed journal (or) Industry Oriented Mini Project in collaboration with an industry of their specialization. Students shall register for this immediately after II-Year II Semester Examinations and pursue it during summer vacation/semester break & during III Year without effecting regular course work. Internship at reputed organization (or) Skill development courses (or) Paper presentation in reputed journal (or) Industry Oriented Mini Project shall be submitted in a report form and presented before the committee in III-year II semester before end semester examination. It shall be evaluated for 100 external marks. The committee consists of an External Examiner, Head of the Department, Supervisor of the Industry Oriented Mini Project (or) Internship etc, Internal Supervisor and a Senior Faculty Member of the Department. There shall be **NO internal marks** for Industry Training (or) Internship (or) Mini-Project (or) Skill Development Courses (or) Paper Presentation in reputed journal (or) Industry Oriented Mini Project.

8.5   The UG project shall be initiated at the end of the IV Year I Semester and the duration of the project work is one semester. The student must present Project Stage – I during IV Year I Semester before II Mid examinations, in consultation with his Supervisor, the title, objective and plan of action of his Project work to the departmental committee for approval before commencement of IV Year II Semester. Only after obtaining the approval of the departmental committee, the student can start his project work.

8.6   UG project work shall be carried out in two stages: Project Stage – I for approval of project before Mid-II examinations in IV Year I Semester and Project Stage – II during IV Year II Semester. Student has to submit project work report at the end of IV Year II Semester. The project shall be evaluated for 100 marks before commencement of SEE Theory examinations.

8.7.   For Project Stage – I, the departmental committee consisting of Head of the Department, project supervisor and a senior faculty member shall approve the project work to begin before II Mid-Term examination of IV Year I Semester. The student is deemed to be not eligible to register for the Project work, if he does not submit a report on Project Stage - I or does not make a presentation of the same before the evaluation committee as per schedule.

        A student who has failed may reappear once for the above evaluation, when it is scheduled again; if he fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

8.8   For Project Stage – II, the external examiner shall evaluate the project work for 60 marks and the internal project committee shall evaluate it for 40 marks. Out of 40 internal marks, the departmental committee consisting of Head of the Department, Project Supervisor and a Senior Faculty Member shall evaluate the project work for 20 marks and Project Supervisor shall evaluate for 20 marks. The topics for Industry Oriented Mini Project/ Internship/SDC etc. and the main Project shall be different from the topic already taken. The student is deemed to have failed, if he (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the External Examiner as per schedule, or (iii) secures less than 40% marks in the sum total of the CIE and SEE taken together.

        For conducting viva-voce of project, University selects an external examiner from the list of experts in the relevant branch submitted by the Principal of the College.

        A student who has failed, may reappear once for the above evaluation, when it is scheduled again; if student fails in such 'one reappearance' evaluation also, he has to reappear

for the same in the next subsequent semester, as and when it is scheduled.

8.9. A student shall be given only one time chance to re-register for a maximum of two subjects in a semester:

- If the internal marks secured by a student in the Continuous Internal Evaluation marks for 40 (Sum of average of two mid-term examinations consisting of Objective & descriptive parts, Average of two Assignments & Subject Viva- voce/PPT/ Poster presentation/ Case Study on a topic in the concerned subject) areless than 35% and failed in those subjects.

A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the class work in next academic year.

In the event of the student taking this chance, his Continuous Internal Evaluation marksfor 40 and Semester End Examination marks for 60 obtained in the previous attempt stand cancelled.

9.0   Grading Procedure.

9.1   Grades will be awarded to indicate the performance of students in each Theory Subject, Laboratory/Practicals/ Industry-Oriented Mini Project/Internship/SDC and Project

Stage. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 8 above, a corresponding letter grade shall be given.

9.2.   As a measure of the performance of a student, a 10-point absolute grading system using the following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured in a Subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
Greater than or equal to 90%	O (Outstanding)	10
80 and less than 90%	A^+ (Excellent)	9
70 and less than 80%	A (Very Good)	8
60 and less than 70%	B^+ (Good)	7
50 and less than 60%	B (Average)	6
40 and less than 50%	C (Pass)	5
Below 40%	F (FAIL)	0
Absent	Ab	0

9.3   A student who has obtained an '**F**' grade in any subject shall be deemed to have '**failed**' and is required to reappear as a 'supplementary student' in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier.

9.4.   To a student who has not appeared for an examination in any subject, '**Ab**' grade will be allocated in that subject, and he is deemed to have '**Failed**'. A student will be required to reappear as a 'supplementary student' in the semester end examination, as and when offered next. In this case also, the internal marks in those subjects will remainthe same as those obtained earlier.

9.5.   A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

9.6   A student earns Grade Point (GP) in each subject/ course, on the basis of the letter grade secured in that subject/ course. The corresponding 'Credit Points' (CP) are computed by multiplying the grade point with credits for that particular subject/ course.

Credit Points (CP) = Grade Point (GP) x Credits …. For a course

9.7   A student passes the subject/ course only when **GP ≥ 5 ('C' grade or above)**

9.8   The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points (ΣCP) secured from all subjects/ courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to **two** decimal places. SGPA is thus computed as

$$\text{SGPA} = \left\{ \sum_{i=1}^{N} C_i \, G_i \right\} / \left\{ \sum_{i=1}^{N} C_i \right\} \text{ …. For each semester,}$$

where 'i' is the subject indicator index (considering all subjects in a semester), 'N' is the no. of subjects '**registered**' for the semester (as specifically required and listed under the course structure of the parent department), C_i is the no. of credits allotted to the ith subject, and G_i represents the grade points (GP) corresponding to the letter gradeawarded for that i^{th} subject.

9.9   The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student in all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student in **all** registered courses (of 160) in **all** semesters, and the total number of credits registered in **all** the semesters. CGPA is rounded off to **two** decimal places. CGPA is thus computed from the I year II semester onwards at the end of each semester as per the formula

$$\text{CGPA} = \left\{ \sum_{j=1}^{M} C_j \, G_j \right\} / \left\{ \sum_{j=1}^{M} C_j \right\} \text{ … for all S semesters registered}$$

(i.e., up to and inclusive of S semesters, S ≥ 2),

where '**M**' is the **total** no. of subjects (as specifically required and listed under the course structure of the parent department) the student has '**registered**' i.e., from the 1st semester onwards up to and inclusive of the 8th semester, 'j' is the subject indicator index (takes into account all subjects from 1 to 8 semesters), C_j is the no. of credits allotted to the jth subject, and G_j represents the grade points (GP) corresponding to the letter grade awarded for that j^{th} subject. After registration and completion of I year I semester, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA:

Course/Subject	Credits	Letter Grade	Grade Points	Credit Points
Course 1	4	A	8	4 x 8 = 32
Course 2	4	O	10	4 x 10 = 40
Course 3	4	C	5	4 x 5 = 20
Course 4	3	B	6	3 x 6 = 18
Course 5	3	A+	9	3 x 9 = 27
Course 6	3	C	5	3 x 5 = 15
	21			152

SGPA = 152/21 = 7.24

Illustration of Calculation of CGPA up to 3rd Semester:

Semester	Course/ Subject Title	Credits Allotted	LetterGrade Secured	CorrespondingGrade Point (GP)	Credit Points (CP)
I	Course 1	3	A	8	24
I	Course 2	3	O	10	30
I	Course 3	3	B	6	18
I	Course 4	4	A	8	32
I	Course 5	3	A+	9	27
I	Course 6	4	C	5	20
II	Course 7	4	B	6	24
II	Course 8	4	A	8	32
II	Course 9	3	C	5	15
II	Course 10	3	O	10	30
II	Course 11	3	B+	7	21
II	Course 12	4	B	6	24
II	Course 13	4	A	8	32
II	Course 14	3	O	10	30
III	Course 15	2	A	8	16
III	Course 16	1	C	5	5
III	Course 17	4	O	10	40
III	Course 18	3	B+	7	21

III	Course 19	4	B	6	24
III	Course 20	4	A	8	32
III	Course 21	3	B+	7	21
	Total Credits	**69**		**Total Credit Points**	**518**

$$CGPA = 518/69 = 7.51$$

The calculation process of CGPA illustrated above will be followed for each subsequent semester until 8th semester. The CGPA obtained at the end of 8th semester will becomethe final CGPA secured for entire B.Tech. Programme.

9.10. For merit ranking or comparison purposes or any other listing, **only** the '**rounded off**' values of the CGPAs will be used.

9.11 SGPA and CGPA of a semester will be mentioned in the semester Memorandum of Grades if all subjects of that semester are passed in first attempt. Otherwise the SGPA and CGPA shall be mentioned only on the Memorandum of Grades in which sitting he passed his last exam in that semester. However, mandatory courses will not be taken into consideration.

10.0 Passing Standards

10.1 A student shall be declared successful or 'passed' in a semester, if he secures a GP $\geq$ 5 ('**C**' grade or above) in every subject/course in that semester (i.e. when the student gets an SGPA $\geq$ 5.0 at the end of that particular semester); and he shall be declaredsuccessful or 'passed' in the entire undergraduate programme, only when gets a CGPA $\geq$ 5.00 ('**C**' grade or above) for the award of the degree as required.

10.2 After the completion of each semester, a grade card or grade sheet shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, title, no. of credits, grade earned, etc.) and credits earned. There is NO exemption of credits in any case.

11.0 Declaration of results

11.1 Computation of SGPA and CGPA are done using the procedure listed in 9.6 to 9.9.

11.2 For final percentage of marks equivalent to the computed final CGPA, the following formula may be used.

$$\text{% of Marks} = (\text{final CGPA} - 0.5) \times 10$$

12.0 Award of Degree

12.1. A student who registers for all the specified subjects/ courses as listed in the course structure and secures the required number of 160 credits (with CGPA $\geq$ 5.0), within 8 academic years from the date of commencement of the first academic year, shall be declared to have '**qualified**' for the award of B.Tech. degree in the branch of Engineering selected at the time of admission.

12.2. A student who qualifies for the award of the degree as listed in item 12.1 shall be placedin the following classes.

12.3 A student with final CGPA (at the end of the undergraduate programme) > 8.00, and fulfilling the following conditions - shall be placed in '**First Class with Distinction**'. How-

ever, he

i.　Should have passed all the subjects/courses in '**First Appearance'** within the first 4 academic years (or 8 sequential semesters) from the date of commencement of first year first semester.

ii.　Should not have been detained or prevented from writing the semester end examinations in any semester due to shortage of attendance or any other reason.

A student not fulfilling any of the above conditions with final CGPA > 8 shall beplaced in

'**First Class'.**

12.4　Students with final CGPA (at the end of the undergraduate programme) ≥ 7.0 but < 8.00 shall be placed in '**First Class'.**

12.5　Students with final CGPA (at the end of the undergraduate programme) ≥ 6.00 but < 7.00, shall be placed in '**Second Class'**.

12.6　All other students who qualify for the award of the degree (as per item 12.1), with final CGPA (at the end of the undergraduate programme) ≥ 5.00 but < 6, shall be placed in '**pass class**'.

12.7　A student with final CGPA (at the end of the undergraduate programme) < 5.00 will not be eligible for the award of the degree.

12.8　Students fulfilling the conditions listed under item 12.3 alone will be eligible for awardof 'Gold Medal'.

12.9　Award of 2-Year B.Tech. Diploma Certificate

1.　A student is awarded 2-Year UG Diploma Certificate in the concerned engineering branch on completion of all the academic requirements and earned all the 80 credits (within 4 years from the date of admission) upto B.Tech. II Year II Semester, if the student want to exit the 4-Year B.Tech. Program and *requests for the 2 -Year* B. Tech. (*UG) Diploma Certificate.*

2.　The student **once opted and awarded 2-Year UG Diploma Certificate, thestudent will be permitted to join** in B. Tech. III Year I Semester and continue for completion of remaining years of study for 4-Year B. Tech. Degree ONLY in the next academic year along with next batch students. *However, if any student wishes to continue the study after opting for exit, he/she should register for the subjects/courses in III Year I Semester before commencement of class work for that semester.*

3.　*The students, who exit the 4-Year B. Tech. program after II Year of study and wish to re-join the B.Tech. program, must submit the 2 -Year B. Tech. (UG) Diploma Certificate awarded to him, subject to the eligibility for completion of Course/Degree.*

4.　A student may be permitted to take one year break after completion of II Year II Semester or B. Tech. III Year II Semester (with university permission through the principal of the college well in advance) and can re-enter the course in **next Academic Year in the same college** and complete the course on fulfilling all the academic credentials within a stipulated duration i.e. double the duration of the course (Ex. within 8 Years for 4-Year program).

13.0   Withholding of results

13.1 If the student has not paid the fees to the University at any stage, or has dues pending due to any reason whatsoever, or if any case of indiscipline is pending, the result of the student may be withheld, and the student will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

14.0   Transitory Regulations

A.   For students detained due to shortage of attendance:

1.   A Student who has been detained in I year of R20 Regulations due to lack of attendance, shall be permitted to join I year I Semester of R22 Regulations and he is required to complete the study of B.Tech. Programme within the stipulated period of eight academic years from the date of first admission in I Year.

2.   A student who has been detained in any semester of II, III and IV years of R20 regulations for want of attendance, shall be permitted to join the corresponding semester of R22 Regulations and is required to complete the study of B.Tech. within the stipulated period of eight academic years from the date of first admission in I Year. The R22 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further Transitory Regulations.

B.   For students detained due to shortage of credits:

3.   A student of R20 Regulations, who has been detained due to lack of credits, shall be promoted to the next semester of R22 Regulations only after acquiring the required number of credits as per the corresponding regulations of his/her first admission. The total credits required are 160 including both R20 & R22 regulations. The student is required to complete the study of B.Tech. within the stipulated period of eight academic years from the year of first admission. The R22 Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.

C.   For readmitted students in R22 Regulations:

4.   A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.

5.   The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including R22 Regulations. **There is NO exemption of credits in any case**.

6.   If a student is readmitted to R22 Regulations and has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in R22Regulations will be substituted by another subject to be suggested by the University.

Note: If a student readmitted to R22 Regulations and has not studied any subjects/topicsin his/her earlier regulations of study which is prerequisite for further subjects in R22 Regulations, the College Principals concerned shall conduct remedial classes to cover those subjects/topics for the benefit of the students.

15.   Student Transfers

15.1   There shall be no branch transfers after the completion of admission process.

15.2   There shall be no transfers from one college/stream to another within the constituent colleges and units of Jawaharlal Nehru Technological University Hyderabad.

15.3.   The students seeking transfer to colleges affiliated to JNTUH from various other Universities/institutions have to pass the failed subjects which are equivalent to the subjects of JNTUH, and also pass the subjects of JNTUH which the students have not studied at the earlier institution. Further, though the students have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of JNTUH, the students have to study those subjects in JNTUH in spite of the fact that those subjects are repeated.

15.4   The transferred students from other Universities/Institutions to JNTUH affiliated colleges who are on rolls are to be provided one chance to write the CBT (for internal marks) in the **equivalent subject(s)** as per the clearance letter issued by the University.

15.5   The autonomous affiliated colleges have to provide one chance to write the internal examinations in the **equivalent subject(s)** to the students transferred from other universities/institutions to JNTUH autonomous affiliated colleges who are on rolls, as per the clearance (equivalence) letter issued by the University.

16.0 Scope

16.1   The academic regulations should be read as a whole, for the purpose of any interpretation.

16.2.   In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

16.3   The University may change or amend the academic regulations, course structure or syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the dates notified by the University authorities.

16.4.   Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".

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ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME)
FROMTHE AY 2023-24

1. Eligibility for the award of B.Tech Degree (LES)

    The LES students after securing admission shall pursue a course of study for not lessthan three academic years and not more than six academic years.

2. The student shall register for 120 credits and secure 120 credits with CGPA ≥ 5 from II year to IV-year B.Tech. Programme (LES) for the award of B.Tech. Degree.

3. The students, who fail to fulfil the requirement for the award of the degree in sixacademic years from the year of admission, shall forfeit their seat in B.Tech.

4. The attendance requirements of B. Tech. (Regular) shall be applicable to B.Tech.(LES).

5. Promotion rule

S. No	Promotion	Conditions to be fulfilled
1	Second year first semester to second year second semester	Regular course of study of second yearfirst semester.
2	Second year second semester tothird year first semester	Regular course of study of secondyear second semester. Must have secured at least 24 creditsout of 40 credits i.e., 60% credits up to second year second semester from all therelevant regular and supplementary examinations, whether the student takesthose examinations or not.
3	Third year first semester to third year second semester	Regular course of study of third yearfirst semester.
4	Third year second semester tofourth year first semester	Regular course of study of third yearsecond semester. Must have secured at least 48 creditsout of 80 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takesthose examinations or not.
5	Fourth year first semester to fourth year second semester	Regular course of study of fourth yearfirst semester.

6. All the other regulations as applicable to B. Tech. 4-year degree course (Regular)will hold good for B. Tech. (Lateral Entry Scheme).

7. LES students are not eligible for 2-Year B. Tech. Diploma Certificate.

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Malpractices Rules
Disciplinary Action For / Improper Conduct in Examinations

	Nature of Malpractices/Improperconduct	Punishment
	If the student:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other formof material concerned with or related to the subject of the examination (theory orpractical) in which student is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receivesit from any other student orally or by anyother body language methods or communicates through cell phones with any student or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the students involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any otherform of material relevant to the subject of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The hall ticket of the student is to be cancelled and sent to the University.
3.	Impersonates any other student in connection with the examination.	The student who has impersonated shall be expelled from examination hall. The student isalso debarred and forfeits the seat. The performance of the original student who has been impersonated, shall be cancelled in all thesubjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The student is also debarred for two consecutive

		semesters from class work and all University examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the chief superintendent/assistant – superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the student(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

7.	Leaves the exam hall taking away answer script or intentionally tears off the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
8.	Possesses any lethal weapon or fire-arm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat.
9.	If student of the college, who is not a student for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to the police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared for including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the student has appeared for including practical examinations and project work of that semester/year examinations.

12.	If any malpractice is detected which is not covered in the above clauses 1 to 11shall be reported to the University for further action to award a suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the students as per the above guidelines.

2. Punishment for Institutions: (if the squad reports that the college is also involved inencouraging malpractices)

   • A show-cause notice shall be issued to the college.

   • Impose a suitable fine on the college.

   • Shifting the examination center from one college to another college for a specificperiod of not less than one year.

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B.Tech. COMPUTER SCIENCE AND ENGINEERING-DATA SCIENCE

I YEAR   **I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	MA101BS	Matrix Algebra and Differential Equations	3	1	0	4
2	AP102BS	Applied Physics	3	1	0	4
3	CS103ES	Programming for Problem Solving	3	0	0	3
4	EE104ES	Basic Electrical Engineering	3	0	0	3
5	IT105ES	IT Workshop	0	0	3	1.5
6	AP106BS	Applied Physics Lab	0	0	2	1
7	CS107ES	Programming for Problem Solving Lab	0	0	3	1.5
8	EE108ES	Basic Electrical Engineering Lab	0	0	2	1
9	SD109EN	Skill Development Course - I (Interchange - Business English)	0	0	2	1
10		Induction Programme				
		Total Credits	**12**	**2**	**12**	**20**

I YEAR   **II SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	MA201BS	Vector Calculus and Transforms	3	1	0	4
2	CH202BS	Engineering Chemistry	3	1	0	4
3	AI203ES	Data Structures Through C++	3	1	0	4
4	EN204HS	English for Skill Enhancement	2	0	0	2
5	ME205ES	Computer Aided Engineering Graphics Lab	0	0	3	1.5
6	CH206BS	Engineering Chemistry Lab	0	0	2	1
7	AI207ES	Data Structures Through C++ Lab	0	0	2	1
8	EN208HS	English Language and Communication Skills Lab	0	0	3	1.5
9	SD209BS	Skill Development Course - II (Aptitude and Logic Building)	0	0	2	1
		Total Credits	**11**	**3**	**12**	**20**

B.Tech. COMPUTER SCIENCE AND ENGINEERING-DATA SCIENCE

II YEAR   **I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	EC305ES	Digital Logic Design	3	0	0	3
2	CS302PC	Computer Organization and Architecture	3	0	0	3
3	CS303PC	Operating Systems	3	0	0	3
4	CS304PC	Object Oriented Programming through Java	3	0	0	3
5	MA305BS	Computer Oriented Statistical Methods	3	1	0	4
6	CS306PC	Computer Organization and Architecture Lab	0	0	2	1
7	CS307PC	Operating Systems Lab	0	0	2	1
8	CS308PC	Java Programming Lab	0	0	2	1
9	*MC311	Gender Sensitization Lab	0	0	2	0
10	SD309PC	Skill Development Course-III (Data Visualization-R Programming / Power BI)	0	0	2	1
Total Credits			**15**	**1**	**10**	**20**

*MC − Satisfied/Unsatisfied

II YEAR   **II SEMESTER**

S. No	Course Code	Course Title	L	T	P	Credits
1	SM401MS	Business Economics & Financial Analysis	3	0	0	3
2	IT402PC	Discrete Mathematics	3	0	0	3
3	IT403PC	Database Management Systems	3	0	0	3
4	AI404PC	Design and Analysis of Algorithms	3	0	0	3
5	CS405PC	Software Engineering	3	0	0	3
6	IT406PC	Database Management Systems Lab	0	0	2	1
7	DS407PC	Design and Analysis of Algorithms Lab	0	0	2	1
8	CS408PC	Software Engineering Lab	0	0	2	1
9	CS409PC	Real-time Research Project/Societal Related Project	0	0	2	1
10	*MC412	Environmental Science	2	0	0	0
11	SD410PC	Skill Development Course -IV (Node JS / React JS / D Jango)	0	0	2	1
Total Credits			17	0	10	20

*MC – Satisfied/Unsatisfied

IIIYEAR   **I-SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	CS501PC	Computer Networks	3	0	0	3
2	DS502PC	Introduction to Data Science	3	1	0	4
3	CS503PC	Artificial Intelligence	3	0	0	3
4	DS504PC	Data Mining	3	0	0	3
5		Professional Elective-1	3	0	0	3
6	DS505PC	R Programming Lab	0	0	2	1
7	CS506PC	Artificial Intelligence Lab	0	0	2	1
8	DS507PC	Data Mining Using Python Lab	0	0	2	1
9	*MC510	Intellectual Property Rights	2	0	0	0
10	SD509PC	Skill Development Course (ETL-Kafka / Talend)	0	0	2	1
		Total Credits	17	1	8	20

*MC − Satisfied/Unsatisfied

III YEAR   **II-SEMESTER**

S.No.	Course Code	Course Title	L	T	P	Credits
1	IT601PC	Automata Theory and Compiler Design	3	1	0	4
2	CS602PC	Machine Learning	3	0	0	3
3	DS603PC	Big Data Analytics	3	0	0	3
4		Professional Elective-II	3	0	0	3
5		Open Elective-I / MOOCS	3	0	0	3
6	CS604PC	Machine Learning Lab	0	0	2	1
7	DS605PC	Big Data Analytics Lab	0	0	2	1
8	EN606HS	Advanced Communications Skills Lab	0	0	2	1
9	SD607PC	Industry Oriented Mini Project/ Internship/ Skill Development Course -VI (UI Design -Flutter)	0	0	2	1
10	*MC609	Constitution of India	2	0	0	0
11	*MC610	Cyber Security	2	0	0	0
		Total Credits	19	1	8	20

*MC − Satisfied/Unsatisfied

IVYEAR   **I SEMESTER**

S . No.	Course Code	Course Title	L	T	P	Credits
1.	DS701PC	Predictive Analytics	3	0	0	3
2.	DS702PC	Web and Social Media Analytics	3	0	0	3
3.		Professional Elective-III	3	0	0	3
4.		Professional Elective-IV	3	0	0	3
5.		Open Elective-II / MOOCs	3	0	0	3
6.	DS703PC	Predictive Analytics Lab	0	0	3	1.5
7.	DS704PC	Web and Social Media Analytics Lab	0	0	3	1.5
8.	DS706PROJ	Project Stage −I	0	0	6	3
		Total Credits	**15**	**0**	**12**	**21**

IV YEAR   **II SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Professional Elective-V	3	0	0	3
2.		Professional Elective-VI	3	0	0	3
3.		Open Elective-III / MOOCs	3	0	0	3
4	DS801PROJ	Seminar	0	0	2	1
5.	DS802PROJ	Project Stage −II	0	0	18	9
		Total Credits	**9**	**0**	**20**	**19**

Professional Electives

Professional Elective-I						
S.No.	Course Code	Course Title	L	T	P	C
1	DS511PE	Parallel and Distributed Computing	3	0	0	3
2	DS512PE	Information Storage Management	3	0	0	3
3	DS513PE	Data Science Applications	3	0	0	3
4	DS514PE	Industrial Robotics	3	0	0	3

Professional Elective-II

S. No.	Course Code	Course Title	L	T	P	C
1	DS621PE	Cloud Computing	3	0	0	3
2	DS622PE	Design Patterns	3	0	0	3
3	DS623PE	Data Engineering	3	0	0	3
4	CS624PE	Information Retrieval Systems	3	0	0	3

Professional Elective – III

S. No	Course Code	Course Title	L	T	P	C
1	DS731PE	Data warehouse and Business Intelligence	3	0	0	3
2	DS732PE	Video Analytics	3	0	0	3
3	CS743PE/DS733PE	Software Testing Methodologies	3	0	0	3
4	DS734PE	Advanced Text and Multimedia Analytics	3	0	0	3

Professional Elective – IV

S. No	Course Code	Course Title	L	T	P	C
1	DS741PE	Spatial and Multimedia Databases	3	0	0	3
2	AI743PE/DS742PE	Speech Recognition	3	0	0	3
3	IT733PE/DS743PE	Software Project Management	3	0	0	3
4	DS744PE	Time Series Analysis	3	0	0	3

Professional Elective – V

S. No	Course Code	Course Title	L	T	P	C
1	DS851PE	Data Stream Mining	3	0	0	3
2	DS852PE	Cryptography and Network Security	3	0	0	3
3	DS853PE/CY854PE	DevOps	3	0	0	3
4	DS854PE	Mining Massive Datasets	3	0	0	3

Professional Elective – VI

S. No	Course Code	Course Title	L	T	P	C
1	DS861PE	Principles of Entrepreneurship	3	0	0	3
2	DS862PE	Internet Of Things	3	0	0	3
3	DS863PE	Blockchain Technology	3	0	0	3
4	CS851PE/AI864PE/ DS864PE/	Deep Learning	3	0	0	3

Open Electives of Data Science

Open Elective – I		
Data Science		
1	DS611OE	Web Programming
2	DS612OE	Introduction to data Science
3	DS613OE	Data Engineering
4	DS614OE	Java Programming

Open Elective – II		
Data Science		
1	DS711OE	Database Management Systems
2	DS712OE	Data Analytics
3	DS713OE	Software Engineering
4	DS714OE	R programming

Open Elective – III		
Data Science		
1	DS811OE	Data Visualization Techniques
2	DS812OE	Scripting Languages
3	DS813OE	Computer Networks
4	DS814OE	Python Programming

B.Tech. COMPUTER SCIENCE AND ENGINEERING-DATA SCIENCE

I YEAR   **I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	MA101BS	Matrix Algebra and Differential Equations	3	1	0	4
2	AP102BS	Applied Physics	3	1	0	4
3	CS103ES	Programming for Problem Solving	3	0	0	3
4	EE104ES	Basic Electrical Engineering	3	0	0	3
5	IT105ES	IT Workshop	0	0	3	1.5
6	AP106BS	Applied Physics Lab	0	0	2	1
7	CS107ES	Programming for Problem Solving Lab	0	0	3	1.5
8	EE108ES	Basic Electrical Engineering Lab	0	0	2	1
9	SD109EN	Skill Development Course - I (Interchange - Business English)	0	0	2	1
10		Induction Programme				
		Total Credits	**12**	**2**	**12**	**20**

I YEAR   **II SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	MA201BS	Vector Calculus and Transforms	3	1	0	4
2	CH202BS	Engineering Chemistry	3	1	0	4
3	AI203ES	Data Structures Through C++	3	1	0	4
4	EN204HS	English for Skill Enhancement	2	0	0	2
5	ME205ES	Computer Aided Engineering Graphics Lab	0	0	3	1.5
6	CH206BS	Engineering Chemistry Lab	0	0	2	1
7	AI207ES	Data Structures Through C++ Lab	0	0	2	1
8	EN208HS	English Language and Communication Skills Lab	0	0	3	1.5
9	SD209BS	Skill Development Course - II (Aptitude and Logic Building)	0	0	2	1
		Total Credits	11	3	13	20

I Year B.Tech. DS- I Sem.

(MA101BS) MATRIX ALGEBRA AND DIFFERENTIAL EQUATIONS

B.Tech. I Year I Sem.   **L /T/ P/ C**

3 / 1 /0/4

Course Objectives: To learn

- Determine the rank of the matrix and applying this concept to solving the system of linear equations.
- Concept of Eigen values and eigenvectorsand to reduce the quadratic form to canonical form.
- Geometrical approach to the mean value theorems and their application to the mathematical problems.
- Partial differentiation Finding maxima and minima of function of two and three variables.
- Methods of solving the differential equations of first order and higher order.

Course Outcomes After learning the contents of this subject the student must be able to

- Solve the system of equations using matrices and interpret the rank of matrix using different methods.
- Apply the concept of Eigen values, Eigen vectors in Cayley Hamilton theorem and Quadratic forms.
- Examine the applications of Mean value theorems. Apply the concept of partial derivatives to findthe extreme values of functions.
- Analyse the solutions of ODE of first order having first degree.
- Solve higher order differential equations.

UNIT-I:

Theory of Matrices

Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations; solving system of Homogeneous and Non-Homogeneous equations, Gauss elimination method, L-U decomposition method.

UNIT-II:

Eigen values and Eigen vectors

Eigen values and Eigen vectors and their properties (without proof); Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); finding inverse and power of a matrix by Cayley-Hamilton Theorem. Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT-III:

Mean value theorems &Partial Differentiation and applications

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series. (All theorems

without proof). Jacobian; Functional dependence and independence, Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT-IV:

First Order ODE

Exact differential equations, Equations reducible to exact differential equations, Linear and Bernoulli's equations;Applications: Newton's law of cooling, Law of natural growth and decay. Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT-V:

Higher Order ODE

Second order linear differential equations with constant coefficients: non-Homogeneous terms of the type , polynomials in x, ; method of variation of parameters. Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

3. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.

REFERENCES BOOKS:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.

B.Tech. DS I Year -I Sem.   **L T P C**

                                                                                 3 1 0 4

AP102BS: APPLIED PHYSICS
(Common for CSE, ECE, IT, CSM, CSD & CSC)

Course Objectives:

The course primarily aims at understanding the behavior of matter in the condensed state and tries to explore the causes with reference to micro level mechanism of the solid matter.

- The objective of the first chapter is to study the micro level behavior of the quantum particles of the matter and assess the draw backs of the free electron theory leading to the introduction of the Band Theory of Solids.

- The second chapter focuses on the working principles and applications of basic semiconductor devices.

- In the third chapter task to discuss dielectric, magnetic properties of the materials and applications.

- In the fourth chapter plan to discuss on fabrication of nanoparticles and their characterization techniques.

- In the fifth chapter, it is expected to understand the basic principles behind the coherent artificial light source (LASER) with reference to their construction, mechanism, operation and classification etc. In second part of this chapter aimed at to study an advanced communication system presently ruling the world throughout i.e. Fiber Optic communication system.

Course Outcomes: After learning the contents of this paper the student must be able to

CO1: Predict the behavior of particle and wave and **solve** their wave functions.

CO2: Distinguish the different types of Semiconductor devices

CO3: Recall and **choose** different materials based on their properties.

CO4:Categorize Nano materials by fabrication methods.

CO5: Examine normal light and laser light and its **application** in communication.

UNIT - I: QUANTUM PHYSICS AND SOLIDS

Quantum Mechanics: Introduction to quantum physics, blackbody radiation – Stefan-Boltzmann's law, Wein's and Rayleigh-Jean's law, Planck's radiation law - photoelectric effect –de-Broglie hypothesis- Davisson and Germer experiment –Heisenberg uncertainty principle - Born interpretation of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box.

Solids: Symmetry in solids, free electron theory (Drude & Lorentz) Variation of Fermi level- with temperature - Bloch's theorem -Kronig-Penney model – E-K diagram- effective mass of electron-origin of energy bands- classification of solids.

UNIT - II: SEMICONDUCTORS AND DEVICES

Intrinsic and extrinsic semiconductors – Hall effect - direct and indirect band gap semiconductors

- construction, principle of operation and characteristics of P-N Junction diode, Zener diode and bipolar junction transistor (BJT) – structure, materials, working principle and characteristics: LED, PIN diode, avalanche photo diode (APD) and solar cells.

UNIT - III: DIELECTRIC, MAGNETIC AND ENERGY MATERIALS

Dielectric Materials: Basic definitions- types of polarizations (qualitative) – piezoelectric, ferroelectric and pyroelectric materials – applications – liquid crystal displays (LCD).

Magnetic Materials: Basic definitions- Hysteresis - soft and hard magnetic materials - magnetostriction, magnetoresistance - applications - memory devices, magnetic field sensors and multiferroics.

Energy Materials: Conductivity of liquid and solid electrolytes- superionic conductors - materials and electrolytes for super capacitors - rechargeable ion batteries, solid fuel cells.

UNIT - IV: NANOTECHNOLOGY

Introduction, Nano scale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, precipitation, combustion methods – top-down fabrication: ball milling - physical vapor deposition (PVD) - chemical vapor deposition (CVD) - characterization techniques - XRD, SEM &TEM - applications of nano materials.

UNIT - V: LASER AND FIBER OPTICS

Lasers: Laser beam characteristics-three quantum processes-Einstein coefficients and their relations-lasing action - pumping methods- ruby laser, He-Ne laser , CO2 laser, semiconductor laser-applications of laser.

Fiber Optics: Introduction to optical fiber- advantages of optical Fibers - total internal reflection, construction of optical fiber - acceptance angle - numerical aperture- classification of optical fibers-losses in optical fiber- optical fiber for communication system – applications: medical, sensor and communication.

TEXT BOOKS:

1. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"- S. Chand Publications, 11th Edition 2019.

2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication,2019

3. Semiconductor Physics and Devices- Basic Principle – Donald A, Neamen, Mc Graw Hill, 4 thEdition,2021.

4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2ndEdition,2022.

5. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1st Edition, 2021.

REFERENCE BOOKS:

1. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.

2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons,11th Edition, 2018.

3. Elementary Solid State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.

4. A.K. Bhandhopadhya - Nano Materials, New Age International, 1stEdition, 2007.

5. Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage Aliaksandr S. Bandarenka, CRC Press Taylor & Francis Group.

6. Energy Materials, Taylor & Francis Group, 1st Edition, 2022.

B.Tech. DS I Year -I Sem   **L T P C**

3 0 0 3

(CS103 ES) -PROGRAMMING FOR PROBLEM SOLVING
(Common for CSE, ECE, IT, CSM, CSD & CSC)

Course Objectives:
* To learn the fundamentals of computers.
* To understand the various steps in program development.
* To learn the syntax and semantics of the C programming language.
* To learn the usage of structured programming approaches in solving problems.

Course Outcomes: The student will learn
* To write algorithms and to draw flowcharts for solving problems.
* To convert the algorithms/flow charts to C programs.
* To code and test a given logic in the C programming language.
* To decompose a problem into functions and to develop modular reusable code.
* To use arrays, pointers, strings and structures to write C programs.
* Searching and sorting problems.

UNIT-I: Introduction to Programming

Compilers, compiling and executing a program.

Representation of Algorithm - Algorithms for finding roots of a quadratic equations, finding minimum and maximum numbersofagivenset,findingifanumberisprimenumberFlowchart/Pseudocodewithexamples,Programdesignand structured programming

Introduction to C Programming Language: variables (with data types and space requirements),Syntax and Logical Errors in compilation, object and executable code, Operators, expressions andprecedence,Expressionevaluation,Storageclasses(auto,extern,staticandregister),typeconversion,The main method and command line arguments Bitwise operations: Bitwise AND, OR, XOR and NOToperators

Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do-while loops

I/O:Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr. Command line arguments

UNIT-II: Arrays, Strings, Structures and Pointers:

Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings.

Structures: Defining structures, initializing structures, unions, Array of structures

Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self referential structures in linked list(no implementation)Enu-

meration data type

UNIT-III: Preprocessor and File handling in C:

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

UNIT-IV: Function and Dynamic Memory Allocation:

Functions: Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries

Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types

UNIT-V: Searching and Sorting:

Basic searching in an array of elements (linear and binary search techniques),Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs

TEXTBOOKS:

1. Jeri R. Hanlyand Elliot B.Koffman, Problem solving and Program Designin C 7ᵗʰ Edition, Pearson
2. B. A. Forouzan and R.F.Gilberg C Programming and Data Structures, Cengage Learning, (3rdEdition)

REFERENCEBOOKS:

1. BrianW.Kernighan and Dennis M.Ritchie, The C Programming Language, Prentice-Hall of India
2. E.Balagurusamy, Computer fundamentals and C, 2ⁿᵈ Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18ᵗʰ Edition, BPB
4. R.G.Dromey, How to solve it by Computer, Pearson(16thImpression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C:The CompleteReference,McGrawHill,4thEdition
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

(EE104ES/ EE204ES) BASIC ELECTRICAL ENGINEERING (R-22)
(Common to CSE/DS/IT/CSD/CSC)

B.TECH DS I YEAR -II SEM   **L T P C**

                                                                                 3 0 0 3

COURSE OBJECTIVES:

- To introduce the concepts of electrical circuits and its components.
- To understand magnetic circuits, DC circuits and AC single phase and three phase circuits.
- To study and understand behavior of transformers.
- To study and understand behavior of DC machines.
- To study and understand behavior of AC machines.

COURSE OUTCOMES:

CO1. Recall the basics of electric, magnetic and electromagnetic circuits.

CO2. Classify the types of machines and explain their working principles.

CO3. Explain the construction of DC and AC machines.

CO4. Analyze the characteristics of 1-Phase and 3-Phase machines.

CO5. Interpret different losses in the machines and determine their efficiency and regulation.

UNIT- I: D.C CIRCUITS

Electrical circuit elements (R,L,C), voltage and current sources, KVL & KCL, analysis of simple circuits with DC excitation. Superposition, Thevenin's and Norton's theorems. Time-domain analysis of first – order RL and RC circuits.

UNIT-II: A.C CIRCUITS

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, analysis of single-phase ac circuits consisting of R , L , C , RL , RC , RLC combinations (series and parallel), resonance in series R-L-C circuit. Three-phase balanced circuit, voltage and current relations in star and delta connections.

UNIT-III: TRANSFORMERS

Ideal and practical transformers, equivalent circuits, losses in transformers, regulations and efficiency. Auto-transformer and three-phase transformer connections.

UNIT-IV: DC MACHINES

DC generators: Construction, working, emf equation and classification, DC motors: construction, working, back emf, torque equation, classification, characteristics, Loss components and efficiency.

UNIT-V: AC MACHINES

Generation of rotating magnetic fields , construction and working of a three-phase induction motor, significance of torque-slip characteristic, starting methods, Loss components and efficiency, construction and working of synchronous generators.

Suggested Text-Books/Reference-Books:

1.   Basic electrical engineering -D. P. Kothari and I. J. Nagrath, 3rd edition 2010, Tata Mc Graw Hill.

2.   D.C. Kulshreshtha, " Basic electrical engineering", Mc Graw Hill, 2009.

3.   L.S. Bobrow , " Fundamentals of electrical engineering" , oxford university press, 2011.

4.   Electrical and Electronics Technology, E. Hughes, 10th edition, Pearson, 2010.

5.   Electrical engineering fundamental, Vincent Deltoro, second edition, Prentice Hall India, 1989.

B.Tech. DS I Year -II Sem   **L T P C**

0 0 3 1.5

IT105ES/IT205ES IT Workshop

Course Objectives: The IT Workshop for engineers is a training lab course spread over 60 hours. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel, Power Point and Publisher.

Course Outcomes:

*   Perform Hardware trouble shooting
*   Understand Hardware components and interdependencies
*   Safeguard computer systems from viruses/worms
*   Document/Presentation preparation
*   Perform calculations using spread sheets

PC Hardware

Task1: Identify the peripherals of a computer, components inaCPUanditsfunctions.Drawtheblockdia-gramoftheCPUalongwiththeconfigurationofeachperipheralandsubmittoyourinstructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task3: Every student should individually install OS (windows and Linux) on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Internet & World Wide Web

Task1: **Orientation & Connectivity Boot Camp:** Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their brows-ers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

Task1–WordOrientation:The mentor needs to give an overview of LaTeX and Microsoft (MS)office

or equivalent (FOSS) toolword:Importance of LaTeX and MSoffice or equivalent(FOSS) tool Word as word Processors, Details of the fourtasks and features that would be covered in each, Using LaTeXand word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, formatpainterin word.

Task 2: Using LaTeX and Word to create a project certificate. Features to be covered:- Formatting Fontsin word , Drop Capin word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and WordArt, Formatting Images, Text boxes, Paragraphs and Mail Merge in word.

Excel

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel–Accessing, overview of toolbars, saving excel files, Using help and resources.

Task1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, autofill, Formatting Text

Task 2 : Calculating GPA - .Features to be covered:- Cell Referencing, Formulae in excel – average, std.deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting.

Power Point

Task 1: Students will be working on basic power point utilities and tools which help them create basic Power Point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notesetc),and Inserting–Background, textures, Design Templates, Hidden slides.

REFERENCEBOOKS:

1.   Comdex Information Technology course toolkit Vikas Gupta, WILEY Dreamtech
2.   The Complete Computer upgrade and repair book, 3rd edition Chery IASchmidt, WILEY Dream

tech

3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.

4. PC Hardware- A Handbook–KateJ. Chase PHI(Microsoft)

5. LaTe X Companion–Leslie Lamport, PHI/Pearson.

6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.

7. IT Essentials PC Hardware and Software Labs and Study Guide Third Edition by Patrick Regan– CISCO Press, Pearson Education.

B.Tech. DS I Year -IISem   **L T P C**

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AP106BS/ AP206BS: APPLIED PHYSICS LAB
(Common for CSE, ECE, IT, CSM, CSD & CSC)

Course Objectives: The objectives of this course for the student are to:

1. Understand the basic principles of quantum physics and band theory of solids.
2. Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
3. Study the fundamental concepts related to the dielectric, magnetic and energy materials.
4. Identify the importance of nano scale, quantum confinement and various fabrications techniques.
5. Study the characteristics of lasers and optical fibres.

Course Outcomes:

1. Recalls the appropriate Principle, theory and formula for the experiment.
2. Choose the appropriate procedures and techniques for the different experiments.
3. Identify the different measuring devices and meters to record the data accurately.
4. Apply the mathematical concepts/equations to obtain results.
5. Analyze the experimental applications in real life by interpreting the results.

LIST OF EXPERIMENTS:

1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode.
5. Input and output characteristics of BJT (CE, CB & CC configurations)
6. a) V-I and L-I characteristics of light emitting diode (LED)

    b) V-I Characteristics of solar cell
7. Determination of Energy gap of a semiconductor.
8. Determination of the resistivity of semiconductor by two probe method.
9. Study B-H curve of a magnetic material.
10. Determination of time constant of RC Circuit
11. a) Determination of the beam divergence of the given LASER beam

    b) Determination of Acceptance Angle and Numerical Aperture of an optical fiber.
12. Understanding the method of least squares – torsional pendulum as an example.

Note: Any 8 experiments are to be performed.

REFERENCE BOOK:

1. Applied Physics Lab Manual, CMREC, Hyd.

2. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.

B.Tech. DS I Year -I Sem   **L T P C**

0 0 3 1.5

CS107ES: PROGRAMMING FOR PROBLEM SOLVING LAB
(Common to CSE/ECE/MECH/IT/CSD / CSM/CSC)

[Note: The programs may be executed using any available Open Source/ Freely available IDE some of the Tools available are:

Code Lite: https://codelite.org/ Code::Blocks:

http://www.codeblocks.org/

DevCpp: http://www.bloodshed.net/devcpp.html Eclipse: http://www.eclipse.org

This list is not exhaustive and is NOT in any order of preference]

Course Objectives: The students will learn the following:
- To work with an IDE to create, edit, compile, run and debugprograms
- To analyze the various steps in program development.
- To develop programs to solve basic problems by understanding basic concepts in C like oper-ators, control statements etc.
- To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
- To Write programs using the Dynamic Memory Allocation concept.
- To create, read from and write to text and binary files

Course Outcomes: The candidate is expected to be able to:
- formulate the algorithms for simple problems
- translate given algorithms to a working and correct program
- correct syntax errors as reported by the compilers
- identify and correct logical errors encountered during execution
- represent and manipulate data with arrays, strings and structures
- use pointers of different types
- create, read and write to and from simple text and binary files
- modularize the code with functions so that they can be reused

Practice sessions:
a. Write a simple program that prints the results of all the operators available in C(including pre/post increment , bitwise and/or/not , etc.). Read required operand values from standard input.
b. Writeasimpleprogramthatconvertsonegivendatatypetoanotherusingautoconversion and cast-ing. Take the values form standard input.

Simple numeric problems:

    a. Write a program for fiend the max and min from the three numbers.

    b. Write the program for the simple, compound interest.

    c. Write program that declares Class awarded for a given percentage of marks, where mark<40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction. Read percentage from standard input.

    d. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:

i. 5 x 1 = 5

  5 x 2 = 10

  5 x 3 = 15

h. Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Expression Evaluation:

    a. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula $s = ut+(1/2)at^2$ where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 (= 9.8m/s^2)).

    b. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

    c. Write a program that finds if a given number is a prime number

    d. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.

    e. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

    f. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

    g. Write a C program to find the roots of a Quadratic equation.

    h. Write a C program to calculate the following, where x is a fractional value. $1-x/2+x^2/4-x^3/6$

j. Write a C program to read in two numbers, x and n, and then compute the sum ofthis

geometric progression: $1+x+x^2+x^3+ .. +x^n$. For example: if n is 3 and x is 5, then the program computes $1+5+25+125$.

Arrays and Pointers and Functions:

a. Write a C program to find the minimum, maximum and average in an array of integers.

b. Write a functions to compute mean, variance, Standard Deviation, sorting of n elements in single dimension array.

c. Write a C program that uses functions to perform the following: i. Addition of Two Matrices

ii. Multiplication of Two Matrices

iii. Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be same.

d. Write C programs that use both recursive and non-recursive functions i. To find the factorial of a given integer.

i. To find the GCD (greatest common divisor) of two given integers.

ii. To findx^n

e. Write a program for reading elements using pointer into array and display the values using array.

f. Write a program for display values reverse order from array using pointer.

g. Write a program through pointer variable to sum of n elements from array.

Files:

a. Write a C program to display the contents of a file to standard output device.

b. Writea C program which copies one file to another, replacing all lower case characters with their upper case equivalents.

c. Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.

d. Write a C program that does the following:

It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (hint: convert the

strings using a to i function)

Now the program asks for an index and a value from the user and the value at that index should be changed to the new value in the file. (hint: use fseek function)

The program should then read all 10 values and print them back.

e. Write a C program to merge two files into a third file (i.e., the contents of the firs t file followed by those of the second are put in the third file).

Strings:

a. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.

b. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent

c. Write a C program that uses functions to perform the following operations: i. To insert a sub-string in to a given main string from a given position.

ii. To delete n Characters from a given position in a given string.

d. Write a C program to determine if the given string is a palindrome or not(Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)

e. Write a C program that displays the position of a character ch in the string S or − 1 if S doesn't contain ch.

f. Write a C program to count the lines, words and characters in a given text.

Miscellaneous:

a. Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, oraverage. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.

b. Write a C program to construct a pyramid of numbers asfollows:

1	*	1	1	*
1 2	* *	2 3	2 2	* *
1 2 3	* * *	4 5 6	3 3 3	* * *
			4 4 4 4	* *
				*

Sorting and Searching:

a. Write a C program that uses non-recursive function to search for a Key value in a given list of integers using linear search method.

b. Write a C program that uses non-recursive function to search for a Key value in a given sorted list of integers using binary search method.

c. Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.

d. Write a C program that sorts the given array of integers using selection sort in descending order

e. Write a C program that sorts the given array of integers using insertion sort in ascending order

f. Write a C program that sorts a given array of names

Suggested Reference Books for solving the problems:

i. Byron Gottfried, Schaum's Outline of Programming with C,McGraw-Hill

ii. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rdEdition)

iii. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language,-Prentice

iv. Hall of India

v. R.G. Dromey, How to solve it by Computer, Pearson (16thImpression)

vi. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.

vii. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition

B.Tech. DS I Year -I Sem   **L T P C**

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(EE108ES) BASIC ELECTRICAL ENGINEERING LAB
(Common to CSE/IT/CSD/CSC)

Course objectives:
- To analyze a given network by applying various electrical laws and network theorems.
- To know the response of electrical circuits for different excitations
- To calculate, measure and know the relation between basic electrical parameters.
- To analyze the performance characteristics of DC and AC electrical machines.

Course Outcomes:
- Get an exposure to basic electrical laws.
- Understand the response of different types of electrical circuits to different excitations.
- Understand the measurement, calculation and relation between the basic electrical parameters.
- Understand the basic characteristics of transformers and electrical machines.

List of experiments/demonstrations:
1. Verification of Ohms Law
2. Verification of KVL and KCL
3. Transient Response of Series RL and RC circuits using DC excitation
4. Transient Response of RLC Series circuit using DC excitation
5. Resonance in series RLC circuit
6. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits.
7. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single Phase Transformer
8. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
9. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta- Delta, Delta-star, Star-Star)
10. Measurement of Active and Reactive Power in a balanced Three-phase circuit
11. Performance Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
12. Torque-Speed Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
13. Performance Characteristics of a Three-phase Induction Motor
14. Torque-Speed Characteristics of a Three-phase Induction Motor
15. No-Load Characteristics of a Three-phase Alternator

B.Tech. DS I Year –I Sem   **L T P C**

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(SD109EN/EN210HS) -BUSINESS ENGLISH FOR ENGINEERS
(Common to CSE//IT/CSD/CSC)

Introduction

The rapid breakdown of national barriers over the last decade has resulted in English language skills acquiring a great deal of importance in business sector. Ability to communicate at work place is vital, particularly in the present professional and business climate. In a world with ever-growing levels of globalization and interconnectivity, the significance of Business Communication increased rapidly. But lack of exposure towards Business Communication is a serious handicap for many aspirants. By recognizing this, the institution has focused to train the Engineering Students for Business Communication and motivating to appear BEC examination which is an internationally recognized qualification for getting employability. It has been introduced from B.Tech first year onwards, that can instruct and prepare the students to get the advantage when enter the job world. In today's globalization, it is more significant to show employers that you can communicate in English effectively in every-day businesscircumstances.

Learning Objectives:

a.   It provides language Skills for real life business situations and improves confidence among students.

b.   To train the students to qualify the BEC examination

c.   Develop study skills and communication skills in formal and informal situations.

Course Outcomes: Students should be able to

•   Use Business English Language effectively in spoken and written Forms.

•   Comprehend the given texts and respond appropriately.

•   Communicate confidently in various contexts and different cultures.

•   Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

Syllabus Exercise-I

•   Business Communication Skills, Interpersonal skills and Intrapersonalskills.

•   Active and Effective Listening Skills.

•   Reading skills: Skimming, Scanning.

•   Verbal Ability: Fundamentals of Grammar - Sentence Structure - Parts of Speech.

•   Online Communication- "The power of word of mouse": an article on the power of online customer opinions

•   Corporate culture- What kind of Company culture would suityou?

Exercise-II

- Corporate Communication: First impression, Personal Grooming, Corporate & Businesseti-quettes.
- Business Relationships: Career advice: letters to an advice column, corporate gift-giving, team-work, thinking globally- "Global HR Management": an article.
- Technical and Business Vocabulary: Idioms, Phrases, Collocations, Abbreviations, and Analo-gy.
- Reading Skills: Intensive Reading and Extensive Reading

Exercise-III

- Presentation Skills: Group Discussion, Presentations, Role Play and Telephone Handling and Interview skills.
- Reading Comprehension and Techniques: Interpreting bar charts, pie chart, table, and tree diagram.
- Listening to statistical information: short extracts-"Café Coffee Day":an article on the growth of the Indian Coffee shop; "Shares and the stock exchange: a web page"; short articles from the financial news; "Teenage Entrepreneurs- Kalido": an article on funding.

Exercise-IV

- Writing skills: Paragraph writing, Formal letter writing (Business letters and Official letters), E-mail, Memo, Report and Essay writing.
- Recruitment- Preparing for an interview, Staff development: "Advertisements for training cours-es: variation between a memo and an advert: sport and business" an article.
- Picture Description including Description of Photos/Images/Posters/Advertisement Analysis etc.,

Exercise-V

- Exercises on Common Errors in Grammar: Tenses, Passive forms, Model verbs, Degrees of comparison, Articles, Reference words, word types and Quantity expressions.
- Usage of Words: Model verbs of obligation, Contrast words, words to describe causes and effects.
- Practice of previous BEC Exam: Listening tracks, Reading, Writing and Speaking parts, Com-munication activities, and Exam skills practice.

REFERENCES:

1. Business BENCHMARK, 2nd Edition, South Asian Edition Student's Book-CUP
2. Swan, M. (2016). Practical English Usage. Oxford University Press.
3. Kumar, S and Lata, P.(2018). Communication Skills. Oxford University Press.
4. Wood, F.T. (2007).Remedial English Grammar. Macmillan.
5. Hamp-Lyons, L. (2006).Study Writing. Cambridge University Press.

Website links:

— http://www.cambridge.org

— http://www.learnenglish.com

— http://www.eslgames.com

— https://www.cambridgeenglish.org/supporting-teachers/

— .https://britishcouncil.zoom.us/webinar/register/WN_Ddm6jFvxTpWAfY-wWeZzX_Q

— .https://www.cambridge.org/gb/education/elevate-trial/

— https://learnenglishteens.britishcouncil.org/skills/listening

— https://www.cambridgeenglish.org/teaching-english/resources-for-teachers/webinars/assessing-writing-introducing-new-teacher-guides/

(MA201BS) VECTOR CALCULUS AND TRANSFORMS

B.Tech. DS I Year -II.Sem   **L T P C**
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Course Objectives: To learn

*   Concept, properties of Laplace transform and solving ordinary differential equations using Laplace transforms techniques.
*   Evaluation of double integrals. Evaluation of improper integrals using Beta and Gamma functions.
*   The physical quantities involved in engineering field related to vector valued functions.
*   The basic properties of vector valued functions and their applications to line, surface and volume integrals.

Course Outcomes: After learning the contents of this subject the student must be able to

*   Find the Laplace transforms for given functions.
*   Apply the Laplace transforms techniques for solving ODE.
*   Solve the double integrals and evaluate the improper integrals using Beta and Gamma functions.
*   Determine gradient, divergent and curl by using vector differentiation.
*   Evaluate the line, surface and volume integrals and converting them from one to another.

UNIT-I: LAPLACE TRANSFORMS

Laplace Transforms; Laplace Transform of standard functions; first shifting theorem; Laplace transforms of functions when they are multiplied and divided by 't'. Laplace transforms of derivatives

and integrals of function; Evaluation of integrals by Laplace transforms; Laplace transforms of Special

functions; Laplace transform of periodic functions.

UNIT- II: INVERSE LAPLACE TRANSFORMS

Inverse Laplace transform by different methods, convolution theorem (without proof), solving ODEs by Laplace Transform method.

UNIT-III: BETA AND GAMMA FUNCTIONS AND DOUBLE INTEGRATION

Beta and Gamma Functions, their properties, evaluation of improper integral using Beta and Gamma Functions. Evaluation of Double Integrals (Cartesian and polar coordinates); Change of order of integration (only Cartesian form); Change of variables.

UNIT-IV: VECTOR DIFFERENTIATION

Vector point functions and scalar point functions. Gradient Divergence and Curl. Directional derivatives, Tangent plane and normal line. Vector Identities. Scalar potential functions. Solenoidal and Irrotational vectors.

UNIT-V: VECTOR INTEGRATION

Line, Surface and Volume Integrals. Vector integral theorems: Green's, Gauss divergence and Stoke's (without proof) and their applications.

TEXT BOOKS:

1.   B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition,2010.

2.   Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.

3.   B.V.Ramana, A text Book of Engineering Mathematics, Tata Mc Graw Hill.

REFERENCES:

1.   G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.

2.   S.R.K. Iyengar and R. K. Jain, Advanced Engineering Mathematics, Narosa Publication.

B.Tech. DS I Year II Sem.　　　　　　　　　　　　　　　　　　**L T P C**

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CH202BS/ CH102BS: ENGINEERING CHEMISTRY

(Common to CSE//IT/CSD/CSC)

Course Objectives:

- To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
- To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.
- To acquire the knowledge of electrochemistry and water treatment which are essential for the Engineers and in industry.
- To identify the type of corrosion and apply various principles for its preventions which are essential for an engineer in industry
- To impart the basic knowledge about solid fuel- coal, liquid fuels- petroleum, kerosene oil and diesel, gaseous fuels – LPG, natural gas their origin, classification, calorific value and its determination.

Course Outcomes:

- The basic concepts included in this course will help the student to gain:
- The knowledge of the physical & chemical parameters of quality of water and explain the process of water treatment
- The knowledge to analyze atomic, molecular and electronic changes, band theory related to conductivity.
- The required principles and concepts of electrochemistry, batteries, polymers and their applications
- Identify the mechanism of corrosion of materials on basis of electrochemical approach and devise corrosion control methods.

UNIT-I

Water technology: Sources of water, Impurities in water, Hardness of water, Temporary and permanent hardness, Units of hardness. Estimation of temporary and permanent hardness of water- EDTA method, Numerical problems. Potable water Treatment-Specifications, Steps involved in Treatment-Sedimentation, Coagulation, Filtration, Sterilization , Chlorination and Break point Chlorination, ozonization. Boiler Troubles-Scales and sludges, Caustic embrittlement, Priming and foaming, Boiler corrosion. Internal conditioning methods - Phosphate, Carbonate, Calgon and Colloidal conditioning. External conditioning method- Ion exchange method.Desalination of Brackish Water- Reverse Osmosis and Electro dialysis

UNIT-II

Energy Sources: Introduction, Calorific value of fuel – HCV, LCV- Dulongs formula (Numerical problem).Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking.

Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process. Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel - Transesterification, advantages

UNIT III

Electrochemistry & Batteries: Electrochemistry: Introduction, Electrode potential, Standard electrode potential ,Electro chemical series and its applications. Electrochemical cell, E.M.F of the cell, Nernst equation- derivation and applications- Determination of EMF, Determination of Equilibrium constant Numerical problems. Types of electrodes- Construction and working and determination of pH using Calomel electrode, Quinhydrone electrode and Glass electrode. Batteries: Construction and working of primary (Lithium cell), secondary (Lead acid storage battery and Lithium-ion battery). Fuel cells: Construction, working and application of H_2-O_2 and methanol-oxygen fuel cells. Introduction to Solar cells and its applications

UNIT IV

Corrosion and its Control: Introduction, Definition, Causes and effects of corrosion. Theories of chemical and electrochemical corrosion.Types of corrosion- Galvanic, Waterline and Pitting corrosion, Factors affecting rate of corrosion.Corrosion control methods- Cathodic protection-Sacrificial anode and impressed current cathodic methods. Surface coatings- Metallic coatings, hot dipping, galvanizing and tinning, Electroplating.

UNIT V

Engineering Materials and Corrosion: **Polymers:** Types of polymerizations (addition, condensation and copolymerization). Mechanism of Free radical Addition polymerization .Plastics: Thermoplastic and Thermosetting resins. Preparation , Properties and engineering applications of PVC, Bakelite, Teflon Fibre Reinforced Plastics (FRP) – applications. Rubbers: Natural rubber and its vulcanization. Bio-degradable polymers-preparation and applications of Polyvinyl acetate .Conducting polymers-Characteristics and Classification with examples-mechanism of conduction in trans polyacetylene and applications of conducting polymers. **Smart materials-** Introduction, classification and their engineering applications-Shape memory materials- Poly L- Lactic acid.

TEXT BOOKS:

1.   Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010.
2.   Engineering Chemistry by Rama Devi and Rath, Cengage learning 2nd Edition 2022.
3.   A text book of Engineering Chemistry by M. Thirumala Chary, E.Laxminarayana and K. Shashikala, Pearson Publications, 2021.
4.   Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications.

REFERENCES BOOKS:

1.   Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015).
2.   Text book of Engineering Chemistry by S.S.Dara, S Chand Publications 2022

B.Tech I Year II Sem.   **L T PC**

3 1 0 4

AI203ES: DATASTRUCTURES THROUGH C++

Common to CSM, CSD, and CSC

Prerequisites: A course on "Programming for Problem Solving".

Course Objectives:

* To understand the basic concepts such as Abstract Data Types, Linear and Non Linear Data structures.
* To understand the notations used to analyze the Performance of algorithms.
* To understand the behavior of data structures such as stacks, queues, trees, hash tables, search trees, Graphs and their representations.
* To choose an appropriate data structure for a specified application.
* To understand and analyze various searching and sorting algorithms.
* To learn to implement ADTs such as lists, stacks, queues, trees, graphs, search trees in C++ to solve problems.

Course Outcomes:

* Ability to choose appropriate data structures to represent data items in real world problems.
* Ability to analyze the time and space complexities of algorithms.
* Ability to design programs using a variety of data structures such as stacks, queues, hash tables, binary trees, search trees, heaps, graphs, and B-trees.
* Able to analyze and implement various kinds of searching and sorting techniques.

UNIT - I

C++ Programming Concepts: Review of C, input and output in C++, functions in C++- value parameters, reference parameters, Parameter passing, function overloading, function templates, Exceptions-throwing an exception and handling an exception, arrays, pointers, new and delete operators, class and object, access specifiers, friend functions, constructors and destructor, Operator overloading, class templates, Inheritance and Polymorphism.

Basic Concepts - Data objects and Structures, Algorithm Specification-Introduction, Recursive algorithms, Data Abstraction, Performance analysis- time complexity and space complexity, Asymptotic Notation-Big O, Omega and Theta notations, Complexity Analysis Examples, Introduction to Linear and Non Linear data structures.

UNIT - II

Representation of single, two dimensional arrays, sparse matrices-array and linked representations.

Linear list ADT-array representation and linked representation, Singly Linked Lists- Operations-Insertion, Deletion, Circularly linked lists-Operations for Circularly linked lists, Doubly Linked Lists- Operations- Insertion, Deletion.

Stack ADT, definition, array and linked implementations, applications-infix to postfix conversion, Post-fix expression evaluation, recursion implementation, Queue ADT, definition, array and linked Implementations, Circular queues-Insertion and deletion operations.

UNIT - III

Trees – definition, terminology, Binary trees-definition, Properties of Binary Trees, Binary Tree ADT, representation of Binary Trees-array and linked representations, Binary Tree traversals, Threaded binary trees, Priority Queues –Definition and applications, Max Priority Queue ADT-implementation-Max Heap-Definition, Insertion into a Max Heap, Deletion from a Max Heap.

UNIT - IV

Searching - Linear Search, Binary Search, Hashing-Introduction, hash tables, hash functions, Overflow Handling, Comparison of Searching methods.

Sorting- Radix Sort, Quick sort, Heap Sort, Merge sort, Comparison of Sorting methods.

UNIT - V

Graphs–Definitions, Terminology, Applications and more definitions, Properties, Graph ADT, Graph Representations- Adjacency matrix, Adjacency lists, Graph Search methods - DFS and BFS, Complexity analysis, Search Trees-Binary Search Tree ADT, Definition, Operations- Searching, Insertion and Deletion, Balanced search trees-AVL Trees-Definition and Examples only, B-Trees- Definition and Examples only, Red-Black Trees-Definitions and Examples only, Comparison of Search Trees.

TEXT BOOKS:

1.   Data structures, Algorithms and Applications in C++, 2nd Edition, Sartaj Sahni, Universities Press.
2.   Data structures and Algorithms in C++, Adam Drozdek, 4th edition, Cengage learning.

REFERENCE BOOKS:

1.   Data structures with C++, J. Hubbard, Schaum's outlines, TMH.
2.   Data structures and Algorithms in C++, M.T. Goodrich, R. Tamassia and D. Mount, Wiley India.
3.   Data structures and Algorithm Analysis in C++, 3rd edition, M. A. Weiss, Pearson.
4.   Classic Data Structures, D. Samanta, 2nd edition, PHI.

B.Tech I YearII Sem.   **L T PC**

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(EN104HS/EN204HS) ENGLISH FOR SKILL ENHANCEMENT
(Common for CSE, ECE, IT, CSM, CSD & CSC)

INTRODUCTION

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of "English for Skill Enhancement" has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students. In English classes, the focus should be on the skills development in the areas of vocabulary, grammar, reading and writing.

Course Objectives: This course will enable the students to:

1.   Improve the language proficiency o fstudents in English with an emphasison Vocabulary, Grammar, Reading and Writing skills.

2.   Develop study skills and communication skills in various professional situations.

3.   Equip students to study engineering subjects more effectively and critically using the theoretical and practical components of the syllabus.

CourseOutcomes: Students will be able to:

CO-1: Choose appropriate vocabulary and sentence structures for their oral and written communication.

CO-2: Demonstrate their understanding of the rules of functional grammar.

CO-3: Develop comprehension skills from the known and unknown passages.

CO-4: Take an active part in drafting paragraphs, letters, essays, d e s c r i p t i o n and reports in various contexts.

CO-5: Acquire basic proficiency in reading and writing of English.

UNIT-I

Chapter entitled '*Toasted English*' **by R.K.Narayan**from *"English:Language, Context andCulture"*-published by Orient Black Swan, Hyderabad.

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes- Synonyms and Antonyms.

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.

Reading: Reading and its Importance- Techniques for Effective Reading.

Writing: Sentence Structures-Importance of Proper Punctuation- Paragraph writing– Types, Features of a Paragraph -Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT –II

hapterentitled'ApproJRD'bySudhaMurthyfrom*"English:Language,ContextandCulture"published*byOrientBlackSwan,Hyderabad.

Vocabulary: Words Often Misspelt- Homophones, Homonyms and Homographs.

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Sub-Skills of Reading–Skimming and Scanning.

Writing: Defining-Describing People, Objects, Places and Events.

UNIT –III

Chapterentitled'**LessonsfromOnlineLearning**'by**F.HaiderAlvi,DeborahHurstetal**from   "*English: Language, Context and Culture"*published by Orient Black Swan, Hyderabad.

Vocabulary: Words Often Confused- Idioms and Phrases.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-Skills of Reading -Intensive Reading and Extensive Reading.

Writing: Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, and Job Application with CV/Resume.

UNIT –IV

hapterentitled'ArtandLiterature'byAbdulKalamfrom*"English:Language,ContextandCulture"*publishedbyOrientBlackSwan,Hyderabad.

Vocabulary: Standard Abbreviations in English.

Grammar: Redundancies in Oral and Written Communication.

Reading: Survey, Question, Read, Recite and Review(SQ3RMethod).

Writing: Essay Writing and Précis Writing.

UNIT –V

Chapterentitled'**Go, Kissthe World'** by **Subroto Bagchi** from*"English: Language, Contextand Culture"*published by Orient Black Swan, Hyderabad.

Vocabulary: Technical Vocabulary and their usage

Grammar: Error identification.

Reading: Techniques for Reading Comprehension.

Writing: Technical Reports- Characteristics of a Report - Structure of Reports (Manuscript Format) and Advertisement making.

TEXTBOOK:

1."English: Language, Context and Culture" by Orient BlackSwan Pvt. Ltd, Hyderabad.2022. Print.

REFERENCEBOOKS:

1.   Effective Academic Writing by Liss and Davis(OUP)

2.   Richards, Jack C. (2022)Interchange Series. Introduction, 1, 2, 3.CambridgeUniversityPress

3.   Wood,F.T.(2007).Remedial English Grammar. Macmillan.

4.   Chaudhuri, SantanuSinha.(2018).LearnEnglish:A Fun Book of Functional Language, Grammar and Vocabulary.(2nd ed.,).Sage Publications India Pvt. Ltd.

5.   Vishwamohan, Aysha.(2013).English for Technical Communication for Engineering Students. McGraw-Hill Education India Pvt. Ltd.

6.   Swan, Michael. (2016).Practical English Usage. Oxford University Press. Fourth Edition.

(ME205ES) Computer Aided Engineering Graphics Lab

B.Tech. I YearII Sem.

Pre-requisites: Nil

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Course Objectives:

1. To develop the ability of visualization of different objects through technical drawings

2. To acquire computer drafting skill for communication of concepts, ideas in the design of engineering products.

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

• Apply computer aided drafting tools to create 2D and 3Dobjects

• sketch conics and different types of solids

• Appreciate the need of Sectional views of solids and Development of surfaces of solids

• Read and interpret engineering drawings

• Conversion of orthographic projection into isometric view and vice versa manually and byusing computer aided drafting.

UNIT — I:

Introduction to Engineering Graphics: Principles of Engineering Graphics and their Significance, Scales—Plain& Diagonal, Conic Sections including the Rectangular Hyperbola—General method only Cycloid, Epicycloid and Hypocycloid, Introduction to Computer aided drafting—views, commands and conics

UNIT- II:

Orthographic Projections: Principles of Orthographic Projections — Conventions — Projections of Points and Lines, Projections of Planeregular geometric figures. Auxiliary Planes. Computer aided orthographic projections — points, lines and planes

UNIT — III:

Projections of Regular Solids—Auxiliary Views-Sections or Sectional views of Right Regular Solids— Prism, Cylinder, Pyramid, Cone— Auxiliary views, Computer aided projections of solids—sectional views

UNIT — IV:

Development of Surfaces of Right Regular Solids —Prism, Cylinder, Pyramid and Cone, Development of surfaces using computer aided drafting

UNIT — V:

Isometric Projections: Principles of Isometric Projection — Isometric Scale — Isometric Views — Conventions—Isometric Views of Lines, Plane Figures, Simple and Compound Solids—Isometric Projec-

tion of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa —Conventions. Conversionofortho graphic projection into isometric view using computer aided drafting.

TEXT BOOKS:

1. Engineering drawing N.D. Bhatt /Charotar
2. Engineering Drawing and graphics Using Auto CAD Third Edition,T.Jeyapoovan, Vikas: S. Chand and company Ltd.

REFERENCE BOOKS:

1. Engineering Drawing, Basant Agrawal and C M Agrawal, Third Edition McGrawHill
2. Engineering Graphics and Design, WILEY, Edition2020
3. Engineering Drawing, M.B.Shah, B.C.Rane /Pearson.
4. Engineering Drawing, N. S. Parthasarathy and Vela Murali,Oxford
5. Computer Aided Engineering Dra.v.ng — K Balaveera Reddy et al — CBS Publishers

Note: Both Internal as well as External examinations are conducted using Computer Aided Drafting.

B.Tech. I YearIISem. **L T P C**
0 0 2 1

CH206BS: ENGINEERING CHEMISTRY LAB
(Common to CSE /IT/CSD/CSC)

LIST OF EXPERIMENTS: (PERFORM ANY 10 EXPERIMENTS)

Experiment No. 1: Estimation of Hardness of water by EDTA Complexometry method

Conductometry:

Experiment No 2: Determination of the concentration of strong acid HCl by Conductometry

Experiment No 3: 3.Determination of the concentration of weak acid CH3COOH by Conductometry

Potentiometry:

Experiment No 4: Estimation of Ferrous iron by Potentiometry using dichromate

Experiment No 5: Estimation of the amount of strong acid HCl by potentiometry.

pH Metry:

Experiment No 6: Determination of strong acid concentration using pH meter

Preparation:

Experiment No 7: Preparation of Bakelite.

Experiment No 8: Preparation Nylon 6,6

Viscosity

9. Determination of viscosity of lubricant by using Ostwald Viscometer

Preparation

10. Preparation of Hand Sanitizer

Virtual Lab experiments

1.   Construction of Fuel cell and its working.
2.   Smart materials for Biomedical applications.
3.   Batteries for electrical vehicles.
4.   Functioning of solar cell and its applications.

TEXT BOOKS

1.   Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022)
2.   Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
3.   College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

B.Tech. I YearIISem.   **L/T/P/C**
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AI207ES: DATA STRUCTURES THROUGH C++ LAB
Common to CSM, CSD, AND CSC

Prerequisites: A Course on "Programming for problem solving".

Course Objectives:
- To write and execute programs in C++ to solve problems using data structures such as arrays, linked lists, stacks, queues, trees, graphs, hash tables and search trees.
- To learn to write C++ programs to implement various sorting and searching $algorithms$.

Course Outcomes:
- Able to identify the appropriate data structures and algorithms for solving real world problems.
- Able to implement various kinds of searching and sorting techniques.
- Able to implement data structures such as stacks, queues, Search trees, and hash tables to solve various computing problems.

List of 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 template-based C++ program that uses functions to perform the following:
   a) Create a doubly linked list of elements.
   b) Delete a given element 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 a C++ program to implement a double ended queue ADT using an array, using a
   doubly linked list.

5. Write a C++ program that uses functions to perform the following:
   a) Create a binary search tree of characters.
   b) Traverse the above Binary search tree recursively in preorder, in order and post order,

6. Write a C++ program that uses function templates to perform the following:
   a) Search for a key element in a list of elements using linear search.
   b) Search for a key element in a list of sorted elements using binary search.

7. Write a template-based C++ program that implements Quick sort algorithm to arrange a list of elements in ascending order.

8. Write a C++ program that implements Heap sort algorithm for sorting a list of integers in ascending order.

9. Write a C++ program that implements Merge sort algorithm for sorting a list of integers in ascending order

10. Write a C++ program to implement all the functions of a dictionary (ADT) using hashing.

11. Write a C++ program that implements Radix sort algorithm for sorting a list of integers in ascending order

12. Write a C++ program that uses functions to perform the following:
    a) Create a binary search tree of integers.
    b) Traverse the above Binary search tree non-recursively in order.

13. Write a C++ program that uses functions to perform the following:
    a) Create a binary search tree of integers.
    b) Search for an integer key in the above binary search tree non-recursively.
    c) Search for an integer key in the above binary search tree recursively.

REFERENCE BOOKS

1.   Data Structures using C++, D. S. Malik, 2nd edition, Cengage learning.
2.   Data Structures using C++, V. Patil, Oxford University Press.
3.   Fundamentals of Data structures in C++, 2nd edition, E. Horowitz, S. Sahni and D. Mehta, Universities Press.
4.   C++ Plus Data Structures, 4th edition, Nell Dale, Jones and Bartlett student edition.

B.Tech I Year II Sem.   **L T PC**

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EN108HS/EN208HS: ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB (R22)
(Common for CSE, ECE, IT, CSM, CSD & CSC)

INTRODUCTION:

The **English Language and Communication Skills (ELCS) Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Course Objectives:

- To facilitatecomputer- assistedmulti- mediainstructionenablingindividualizedand independent language learning
- To sensitizethestudentstothenuancesof English speech sounds, wordaccent, intonation and rhythm
- To bring about a consistent accent and intelligibility by providing an opportunity for practice in speaking
- To improve the fluency of students in spoken English and neutralize the impact ofdialects.
- Totrainstudentstouselanguageappropriatelyforpublicspeaking, group discussions and interviews

COURSE OUTCOMES: Students will be able to:

1. **CO1:** Use English with proper pronunciation.
2. **CO2:Describe** the persons, places, objects and events.
3. **CO3**: **Choose** appropriate vocabulary for oral and written communication.
4. **CO4: Develop** speaking skills with clarity and confidence.

English Language and Communication Skills Lab (ELCS) shall have two parts:

1. Computer Assisted Language Learning (CALL)Lab
2. Interactive Communication Skills (ICS)Lab

owing course content is prescribed for the English Languageand Communication SkillsLab.

Exercise – I
CALL Lab:

Listening Skill- Its importance-Types-Barriers-Effective Listening.

Introduction to Phonetics – Speech Sounds- Vowels and Consonants -Minimal Pairs- Past Tense Marker and Plural Marker.

ICS Lab:

Ice-Breaking Activity and JAM Session.

Exercise – II

CALL Lab: Structure of Syllables - Word Stress - Weak Forms and Strong Forms –Intonation.

ICS Lab: Features of Good Conversation- Situational Dialogues – Role Play- Expressions in Various Situations –Telephone Etiquette.

Exercise - III

CALL Lab: Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI).

ICS Lab: Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing.

Exercise – IV

CALL Lab: Listening for General Details - Listening Comprehension.

ICS Lab: Non-verbal Communication- Making a Short Speech -Extempore- Power Point Presentation.

Exercise – V

CALL Lab: Listening for Specific Details - Listening Comprehension.

ICS Lab: Debate and Group Discussion.

1. Minimum Requirement of infrastructural facilities for ELCS Lab:

Computer Assisted Language Learning(CALL)Lab:

The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.

System Requirement(Hardware component):

Computer network with LAN facility(minimum 40 systems with multimedia)with the following specifications:

• Computers with Suitable Configuration
• High Fidelity Head phones

1. Interactive Communication Skills(ICS)Lab:

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V. or LCD, a digital stereo –audio & video system and camcorder etc.

Suggested Software:

• OxfordAdvancedLearner'sCompass,10th Edition.
• English in Mind(Series1-4),Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.

- English Pronunciation in Use(Elementary, Intermediate, Advanced) Cambridge University Press.

- English Vocabularyin Use(Elementary, Intermediate,Advanced) Cambridge University Press.

- TOEFL & GRE(KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).

REFERENCEBOOKS:

1.   (2022).*English Language Communication Skills-Lab Manualcum Work book.* Cengage Learning India Pvt. Ltd.

2.   Kumar, Sanjay & Lata, Pushp.(2019).*Communication Skills: A Workbook.* Oxford University Press

3.   Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.* Orient Black Swan Pvt. Ltd.

4.   Mishra,Veerendraetal.(2020).*EnglishLanguageSkills:APracticalApproach.*CambridgeUniversityPress

B.Tech. I Year II Sem. **L T PC**

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(SD209BS/MA209HS): SKILL DEVELOPMENT COURSE
(APTITUDE AND LOGIC BUILDING)

Course Objectives:

* To enhance the problem-solving skills, to improve the basic mathematical skills and to help students who are preparing for any type of competitive examinations..

Course Outcomes: After learning the contents of this subject the student must be able to

* Evaluate the problems on Percentage, profit and loss.
* Solve the problems given on Partnerships and simple and compound interest.
* Evaluate the problems on Time & Work, Pipes & Cisterns, Boats & Streams.
* Determine the solutions for the problems based on Time & Distance, Trains.
* Interpret the diagrams and solve the questions related to clocks and calendar.

Unit-I: Percentages and Profit & Loss

Percentages: Percentage difference, Percentage increase & decrease, fraction to Percentage, Percentage vs per cent.

Profit & Loss: Cost price, selling price, percentages of profit & loss.

Unit-II: Partnerships and Simple & Compound interest

Partnerships: definition, Ratio of division of gains, working and sleeping partners.

Simple &Compound interest: Principal amount, time & rate of interest.

Unit-III: Time & Work, Pipes & Cisterns and Boats & Streams

Time & Work: Introduction, time & work by using fractions and percentages.

Pipes & Cisterns: Inlet, Outlet, time to emptying & filling a tank.

Boats & Streams: Upstream, downstream, still water, stream related problems, average speed, distance, speed when time is given.

Unit-IV: Time & Distance and Trains

Time & Distance: Time, Speed, Average and Distance related problems.

Trains: Pass a point, Stationary object of length, moving objects same & opposite directions.

Unit-V: Clocks and Calendars

Clocks: Introduction, minute space, minute& hour hands angle between hands.

Calenders: Odd & Even day, week, leap& Ordinary year, century.

TEXTBOOK:

1. Quantitative aptitude by Dr.R.S. Agarwal, S.Chand publications.

2. Verbal and Non-Verbal Reasoning by Dr.R.S.Agarwal.

REFERENCES:

1. Fast track Objective Arithmetic by Rajesh verma – Arihant Publications: fourth edition (2018).

2. Quantitative aptitude for all Competitive Examinations by Abhijith Guha – McGraw Hill Education: sixth edition (2016).

II YEAR
I SEMESTER SYLLABUS

B.Tech. COMPUTER SCIENCE AND ENGINEERING-DATA SCIENCE

II YEAR   **I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	EC305ES	Digital Logic Design	3	0	0	3
2	CS302PC	Computer Organization and Architecture	3	0	0	3
3	CS303PC	Operating Systems	3	0	0	3
4	CS304PC	Object Oriented Programming through Java	3	0	0	3
5	MA305BS	Computer Oriented Statistical Methods	3	1	0	4
6	CS306PC	Computer Organization and Architecture Lab	0	0	2	1
7	CS307PC	Operating Systems Lab	0	0	2	1
8	CS308PC	Java Programming Lab	0	0	2	1
9	*MC311	Gender Sensitization Lab	0	0	2	0
10	SD309PC	Skill Development Course-III (Data Visualization-R Programming / Power BI)	0	0	2	1
		Total Credits	**15**	**1**	**10**	**20**

*MC – Satisfied/Unsatisfied

II YEAR   **II SEMESTER**

S. No	Course Code	Course Title	L	T	P	Credits
1	SM401MS	Business Economics & Financial Analysis	3	0	0	3
2	IT402PC	Discrete Mathematics	3	0	0	3
3	IT403PC	Database Management Systems	3	0	0	3
4	AI404PC	Design and Analysis of Algorithms	3	0	0	3
5	CS405PC	Software Engineering	3	0	0	3
6	IT406PC	Database Management Systems Lab	0	0	2	1
7	DS407PC	Design and Analysis of Algorithms Lab	0	0	2	1
8	CS408PC	Software Engineering Lab	0	0	2	1
9	CS409PC	Real-time Research Project/Societal Related Project	0	0	2	1
10	*MC412	Environmental Science	2	0	0	0
11	SD410PC	Skill Development Course -IV (Node JS / React JS / D Jango)	0	0	2	1
		Total Credits	**17**	**1**	**10**	**20**

*MC – Satisfied/Unsatisfied

B.TECH II Year I Sem.   **L T P C**
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EC305ES: DIGITAL LOGIC DESIGN

CourseObjectives:

- Comprehend different number systems including the binary system and Boolean algebraic principles.
- Create minimal realizations of single and multiple output Boolean functions;
- Design and analyze combinational circuits using medium scale integrated (MSI)components, including arithmetic logic units;
- Apply strategies for state minimization, state assignment, for the implementation of synchronous Finite State Machines
- Design of Combinational Programmable Logic Devices (CPLDs) like PROM, PAL, and PLA and develop HDL Models for Logic Circuits.

CourseOutcomes:

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

- Apply knowledge of fundamental Boolean principles and manipulation to design Logic Circuits.
- Apply various techniques of Boolean functions implification to create minimal expressions.
- Create combinational circuits for a specified behavior with minimal specification.
- Synthesize Sequential circuits with minimal states.
- Realize combinational circuitry using Combinational PLDs and develop & test HDL models of Logic Circuits.

UNITI

Binary Systems: Digital Systems, Binary Numbers, Number Base Conversions, Octal and Hexadecimal Numbers, Complements, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, Binary Logic.

Boolean Algebra And Logic Gates: Basic Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms,Other Logic Operations, Digital Logic Gates, Integrated Circuits.

UNITII

Gate-Level Minimization: The Map method, Four-variable map, Five-variable map, Product of Sum's simplifications, don't care conditions, NAND and NOR implementation, other two level implementations, Exclusive-OR Function.

UNITIII

Combinational Logic: Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers.

UNITIV

Synchronous Sequential Logic: Sequential Circuits, Latches, Flip-Flops, Analysis of clocked sequential circuits, State Reduction and Assignment, Design Procedure.

Registers and Counters: Registers, Shift registers, Ripple Counters, Synchronous Counters, other counters.

UNITV

Memory and Programmable Logic: Introduction, Random Access Memory, Memory decoding, Error detection and correction, Read only Memory, Programmable Logic Array, Programmable Array Logic, Sequential Programmable Devices.

Hardware Description Language: Hardware Description Language, Definition, Structural Definition of HDL, HDL models for Combinational circuits, HDL for models for Sequential circuits.

Text Books:

1. Digital Design with an Introduction to the Verilog HDL – Fifth Edition, M. Morris Mano, Pearson Education.
2. Fundamentals of Logic Design – Roth,7thEdition, Thomson.

References:

1. Switching and Finite Automata Theory by ZVI.Kohavi, Tata Mc Graw Hill.
2. Switching and Logic Design–CVS Rao, Pearson Education
3. Digital Principles and Design–Donald D.Givone, Tata McGraw Hill.
4. Fundamentals of Digital Logic and Micro Computer Design, 5th Edition, M.Rafiquzzaman (JohnWilley)

B.TECH II Year II Sem.   **LTPC**

3003

DS405PC/CS302PC: COMPUTER ORGANIZATION AND ARCHITECTURE
(Only to CSD)

Pre-requisite: A Course on "Digital Logic Design and Microprocessors".

Course Objectives:

- The purpose of the course is to introduce principles of computer organization and the basic architectural concepts.
- It begins with basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
- Topics include computer arithmetic, instruction set design, micro programmed control unit, pipelining and vector processing, memory organization and I/O systems, and multiprocessors

Course Outcomes:

- Understand the basics of instructions sets and their impact on processor design.
- Demonstrate an understanding of the design of the functional units of a digital computer system.
- Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.
- Designapipelineforconsistentexecutionofinstructionswithminimumhazards.
- Recognizeandmanipulaterepresentationsofnumbersstoredindigitalcomputers

UNIT-I

Digital Computers: Introduction, Block diagram of Digital Computer Definition of Computer Organization, Computer Design and Computer Architecture.

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

Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT-II

Micro programmed Control: Control memory, Address sequencing, micro program example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

UNIT-III

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating–point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT-IV

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

UNIT-V

Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics.

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

Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Inter processor arbitration, Inter processor communication and synchronization, Cache Coherence.

TEXTBOOK:

1. Computer System Architecture–M. MorisMano, Third Edition, Pearson/PHI.

REFERENCES:

1. Computer Organization – Car Hamacher, ZvonksVranesic, SafeaZaky, V[th] Edition, McGrawHill.
2. Computer Organization and Architecture–William Stallings Sixth Edition, Pearson/PHI.
3. Structured Computer Organization–AndrewS. Tanenbaum, 4[th]Edition, PHI/Pearson.

B.TECH II Year I Sem. **L T P C**

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CS303PC: OPERATING SYSTEMS
(Common to CSE/IT/CSD/CSM/CSC)

Prerequisites:

1. A course on "Computer Programming and Data Structures".

2. A course on "Computer Organization and Architecture".

Course Objectives:

- Introduceoperatingsystemconcepts(i.e.,processes,threads,scheduling,synchronization,dead-locks,memorymanagement,file and I/Osubsystemsand protection)

- Introducetheissuestobeconsideredinthedesignanddevelopmentofoperatingsystem

- Introduce basic Unix commands, system call interface for process management, inter process communication and I/Oin Unix

Course Outcomes:

- Will be able to control access to a computer and the files that may be shared

- Demonstrate the knowledge of the components of computers and their respective roles in computing.

- Ability to recognize and resolve user problems with standard operating environments.

- Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.

UNIT-I

Operating System-Introduction, Structures-SimpleBatch,Multiprogrammed,Time-shared,Personal-Computer,Parallel,Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls

Process - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads

UNIT-II

CPU Scheduling-Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling. System call interface for process management-fork, exit, wait, waitpid, exec

Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock

UNIT-III

Process Management and Synchronization-The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors **Inter process Communication Mechanisms:** IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

UNIT-IV

Memory Management and Virtual Memory - Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

UNIT-V

File System Interface and Operations-Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create, read, write, close, l seek, stat, I octl system calls.

TEXTBOOKS:

1.   Operating System Principles-Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.

2.   Advanced programming in the UNIX environment, W.R.Stevens, Pearson education.

REFERENCEBOOKS:

1.   Operating Systems-Internals and Design Principles, William Stallings,Fifth Edition–2005,Pearson Education/PHI

2.   Operating System A Design Approach-Crowley, TMH.

3.   Modern Operating Systems, AndrewS.Tanenbaum2ndedition,Pearson/PHI

4.   UNIX programming environment, Kernighan and Pike, PHI/Pearson Education

5.   UNIX Internals- The New Frontiers, U. Vahalia, Pearson Education.

B.TECH II Year I Sem.   **L T P C**

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CS304PC: OBJECT ORIENTED PROGRAMMING THROUGH JAVA
(Common to CSE/IT/CSM/ CSD/CS)

Course Objectives

- To understand the basic object-oriented programming concepts and apply them in problem solving.
- To illustrate inheritance concepts for reusing the program.
- To demonstrate multitasking by using multiple threads and event handling
- To develop data-centric applications using JDBC.
- To understand the basics of java console and GUI based programming

Course Outcomes

- Demonstrate the behavior of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.
- Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords
- Use multithreading concepts to develop inter process communication.
- Understand the process of graphical user interface design and implementation using AWT or swings.
- Develop applets that interact abundantly with the client environment and deploy on the server.

UNIT - I

Object oriented thinking and Java Basics- Need for oop paradigm, summary of oop concepts, coping with complexity, abstraction mechanisms. A way of viewing world – Agents, responsibility, messages, methods, History of Java, Java buzzwords, data types, variables, scope and lifetime of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, method binding, inheritance, overriding and exceptions, parameter passing, recursion, nested and inner classes, exploring string class.

UNIT - II

Inheritance, Packages and Interfaces – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces. Exploring java.io.

UNIT - III

Exception handling and Multithreading-- Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception subclasses. String handling, Exploring java.util. Differences between multithreading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication, thread groups, daemon threads. Enumerations, autoboxing, annotations, generics.

UNIT - IV

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, checkbox groups, choices, lists panels – scrollpane, dialogs, menubar, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

UNIT - V

Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets. Swing – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS:

1.   Java the complete reference, 7th edition, Herbert schildt, TMH.
2.   Understanding OOP with Java, updated edition, T. Budd, Pearson education.

REFERENCE BOOKS:

1.   An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John Wiley & Sons.

2.   An Introduction to OOP, third edition, T. Budd, Pearson education.

3.   Introduction to Java programming, Y. Daniel Liang, Pearson education.

4.   An introduction to Java programming and object-oriented application development, R.A. Johnson- Thomson.

5.   Core Java 2, Vol 1, Fundamentals, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education.

6.   Core Java 2, Vol 2, Advanced Features, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education

7.   Object Oriented Programming with Java, R.Buyya, S.T.Selvi, X.Chu, TMH.

8.   Java and Object Orientation, an introduction, John Hunt, second edition, Springer. 9. Maurach's Beginning Java2 JDK 5, SPD.

B.TECH II Year I Sem. **L T P C**

3 1 0 4

MA305BS: COMPUTER ORIENTED STATISTICAL METHODS
(Common to CSD/CS)

Pre-requisites: Mathematics courses of first year of study.

Course Objectives: Tolearn
- The theory of Probability, and probability distributions of single and multiple random variables
- The sampling theory and testing of hypothesis and making inferences
- Stochastic process and Marko chains.

Course Outcomes: After learning the contents of this subject, the student must be able to
- Apply the concepts of probability and distributions to some case studies.
- Correlate the material of one unit to the material in other units.
- Resolve the potential misconceptions and hazards in each topic of study.

UNIT-I

Probability: Sample Space, Events, Counting Sample Points, Probability of an Event, Additive Rules, Conditional Probability, Independence, and the Product Rule, Bayes' Rule.

Random Variables and Probability Distributions: Concept of a Random Variable, Discrete

Probability Distributions, Continuous Probability Distributions, Statistical Independence.

UNIT-II

Mathematical Expectation: Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables, Chebyshev's Theorem.

Discrete Probability Distributions: Introduction and Motivation, Binomial, Distribution, Geometric Distributions and Poisson distribution.

UNIT-III

Continuous Probability Distributions: Continuous Uniform Distribution, Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial, Gamma and Exponential Distributions.

Fundamental Sampling Distributions: Random Sampling, Some Important Statistics, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, Sampling Distribution of S 2, t–Distribution, F-Distribution.

UNIT-IV

Estimation & Tests of Hypotheses: Introduction, Statistical Inference, Classical Methods of Estimation.: Estimating the Mean, Standard Error of a Point Estimate, Prediction Intervals, Tolerance Limits,

Estimating the Variance, Estimating a Proportion for single mean , Difference between Two Means, between Two Proportions for Two Samples and Maximum Likelihood Estimation.

Statistical Hypotheses: General Concepts, Testing a Statistical Hypothesis, Tests Concerning a Single Mean, Tests on Two Means, Test on a Single Proportion, Two Samples: Tests on Two Proportions.

UNIT-V

Stochastic Processes and Markov Chains: Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, n-step transition probabilities, Markov chain, Steady state condition, Markov analysis.

TEXT BOOKS:

1.   Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics for Engineers &Scientists,9thEdition.PearsonPublishers.
2.   S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications.
3.   S. D. Sharma, Operations Research ,Kedarnath and Ramnath Publishers, Meerut, Delhi

REFERENCEBOOKS:

1.   T.T. Soong, Fundamentals of Probability And Statistics For Engineers, John Wiley & Sons Ltd, 2004.

2.   Sheldon M Ross, Probability and statistics for Engineers and scientists, Academic Press.

B.TECH II Year I Sem   **L T P C**

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CS306PC: COMPUTER ORGANIZATION AND ARCHITECTURE LAB

Exercises in Digital Logic Design

1. Implement Logic gates using NAND and NOR gates
2. Design a Full adder using gates
3. Design and implement the 4:1 MUX, 8:1 MUX using gates /ICs.
4. Design and Implement a 3 to 8 decoder using gates
5. Design a 4 bit comparator using gates/IC
6. Design and Implement a 4 bit shift register using Flip flops
7. Design and Implement a Decade counter

Exercises in Micro Processor programming:

Write assembly language programs for the following using GNU Assembler.

1. Write assembly language programs to evaluate the expressions:
   i) $a = b + c - d * e$
   ii) $z = x * y + w - v + u / k$
      a. Considering 8-bit, 16 bit and 32 bit binary numbers as b, c, d, e.
      b. Considering 2 digit, 4 digit and 8 digit BCD numbers.
      Take the input in consecutive memory locations and also Display the results by using "int xx" of 8086. Validate program for the boundary conditions.
2. Write an ALP of 8086 to take N numbers as input. And do the following operationson them.
      a. Arrange in ascending and descending order.
3. Write an ALP of 8086 to take N numbers as input. And do the following operationson them.
      a. Find max and minimum
      b. Find average
   Considering 8-bit, 16 bit binary numbers and 2 digit, 4digit and 8 digit BCD numbers. Displaythe results by using "int xx" of 8086. Validate program for the boundary conditions.

4. Write an ALP of 8086 to take a string of as input (in 'C' format)and do the followingOperations on it.
      a. Find the length
      b. Find it is Palindrome or n.
   Considering 8-bit, 16 bit binary numbers and 2 digit, 4digit and 8 digit BCD numbers. Display the results by using "int xx" of 8086. Validate program for the boundary conditions.

5. Write an ALP of 8086 to take a string of as input (in 'C' format) and do the fol-

lowingOperations on it.
   a. Find whether given string substring or not.

6. Write an ALP of 8086 to take a string of as input (in 'C' format) and do thefol-lowingOperations on it
   a. Find the Armstrong number
   b. Find the Fibonacci series for n
   numbers Display the results by us-ing "intxx" of 8086.

7. Write the ALP to implement the above operations as procedures and call from themain procedure.

8. Write an ALP of 8086 to find the factorial of a given number as a Procedure and callfrom the main program which display the result.

REFERENCE BOOKS:

1.   Switching theory and logic design –A. Anand Kumar PHI, 2013
2.   Advanced microprocessor & Peripherals-A. K. Ray and K. M. Bherchandavi,TMH, 2nd edition.
3.   Switching and Finite Automatic theory-ZVI. Kohavi, Niraj K.Jha Cambridge, 3rdedition
4.   Digital Design –Morris Mano, PHI, 3rd edition
5.   Microprocessor and Interfacing –Douglas V. Hall, TMGH 2nd edition.

B.TECH II Year I Sem.   **L T P C**

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CS307PC: OPERATING SYSTEMS LAB
(Using UNIX/LINUX)
(Common to CSE/IT/CSD/CSM/CS)

Prerequisites: A course on "Programming for Problem Solving", A course on "Computer Organization and Architecture".

Co-requisite: A course on "Operating Systems".

Course Objectives:
- To provide an understanding of the design aspects of operating system concepts through simulation
- Introduce basic Unix commands, system call interface for process management, inter process communication and I/O in Unix

Course Outcomes:
- Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management.
- Able to implement C programs using Unix system calls

List of Experiments:

1. Write C programs to simulate the following CPU Scheduling algorithms a) FCFS b) SJF c) Round Robin d) priority

2. Write programs using the I/O system calls of UNIX/LINUX operating system (open, read, write, close, fcntl, seek, stat, opendir, readdir)

3. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.

4. Write a C program to implement the Producer – Consumer problem using semaphores using UNIX/LINUX system calls.

5. Write C programs to illustrate the following IPC mechanisms a) Pipes b) FIFOs c) Message Queues   d) Shared Memory

6. Write C programs to simulate the following memory management techniques a) Paging b) Segmentation

7. Write C programs to simulate Page replacement policies a) FCFS b) LRU c) Optimal

TEXT BOOKS:

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley

2. Advanced programming in the Unix environment, W.R.Stevens, Pearson education.

REFERENCE BOOKS:

1.   Operating Systems – Internals and Design Principles, William Stallings, Fifth Edition–2005, Pearson Education/PHI

2.   Operating System - A Design Approach-Crowley, TMH.

3.   Modern Operating Systems, Andrew S Tanenbaum, 2nd edition, Pearson/PHI

4.   UNIX Programming Environment, Kernighan and Pike, PHI/Pearson Education

5.   UNIX Internals: The New Frontiers, U. Vahalia, Pearson Education

B.Tech. II Year I Sem.   **L/T/P/C**
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CS308PC: JAVA PROGRAMMING LAB
(Common to CSE/ IT/CSM/ CSD/CS)

Course Objectives:

• To write programs using abstract classes.

• To write programs for solving real world problems using the java collection framework.

• To write multithreaded programs.

• To write GUI programs using swing controls in Java.

• To introduce java compiler and eclipse platform.

• To impart hands-on experience with java programming.

Course Outcomes:

• Able to write programs for solving real world problems using the java collection framework.

• Able to write programs using abstract classes.

• Able to write multithreaded programs.

• Able to write GUI programs using swing controls in Java.

Note:

1. Use LINUX and MySQL for the Lab Experiments. Though not mandatory, encourage the use of the Eclipse platform.

2. The list suggests the minimum program set. Hence, the concerned staff is requested to add more problems to the list as needed.

List of Experiments:

1. Use Eclipse or Net bean platform and acquaint yourself with the various menus. Create a test project, add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.

2. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.

3. A) Develop an applet in Java that displays a simple message.

4. B) Develop an applet in Java that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named "Compute" is clicked.

5. Write a Java program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num 2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box.

6. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.

7. Write a Java program for the following: Create a doubly linked list of elements.

8. Delete a given element from the above list. Display the contents of the list after deletion.

9. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "Stop" or "Ready" or "Go" should appear above the buttons in the selected color. Initially, there is no message shown.

10. Write a Java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle, and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

11. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using Labels in Grid Layout.

12. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).

13. Write a Java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (\t). It takes a name or phone number as input and prints the corresponding other value from the hash table (hint: use hash tables).

14. Write a Java program that correctly implements the producer – consumer problem using the concept of inter thread communication.

15. Write a Java program to list all the files in a directory including the files present in all its subdirectories.

REFERENCE BOOKS:

1. Java for Programmers, P. J. Deitel and H. M. Deitel, 10th Edition Pearson education.

2. Thinking in Java, Bruce Eckel, Pearson Education.

3. Java Programming, D. S. Malik and P. S. Nair, Cengage Learning.

4. Core Java, Volume 1, 9th edition, Cay S. Horstmann and G Cornell, Pearson.

B.TECH II Year I Sem.   **L T P C**

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MC311: GENDER SENSITIZATION LAB
(An Activity-based Course)
(Common to CSE/IT/CSD/CSC)

COURSE DESCRIPTION

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender- based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

Objectives of the Course:

• To develop students' sensibility with regard to issues of gender in contemporary India.
• To provide a critical perspective on the socialization of men and women.
• To introduce students to information about some key biological aspects of genders.
• To expose the students to debates on the politics and economics of work.
• To help students reflect critically on gender violence.
• To expose students to more egalitarian interactions between men and women.

Learning Outcomes:

• Students will have developed a better understanding of important issues related to gender in contemporary India.
• Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
• Students will attain a finer grasp of how gender discrimination works in our society and how to counterit.
• Students will acquire insight into the gendered division of labour and its relation to politics and economics.
• Men and women students and professionals will be better equipped to work and live together as equals.
• Students will develop a sense of appreciation of women in all walks of line.

- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

UNIT - I: UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men

Preparing for Womanhood. Growing up Male. First lessons in Caste.

UNIT – II: GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences- Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

UNIT – III: GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work.

-Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Main streaming

UNIT – IV: GENDER - BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu".*

Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…."

UNIT – V: GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks-The Brave Heart.

Note: Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

- Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on "Gender".

- **ESSENTIAL READING**: The Textbook, "*Towards a World of Equals: A Bilingual Textbook on Gender" written* by A.Suneetha1, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, GoguShyamala, Deepa Sreenivas and Susie Tharu **published by Telugu Academy, Telangana Government in 2015.**

ASSESSMENT AND GRADING:

- Discussion & Classroom Participation:20%
- Project/Assignment:30%
- End Term Exam:50%

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SD309PC: SKILL DEVELOPMENT COURSE (DATA VISUALIZATION- R PROGRAMMING /POWER BI)
(Common to CSE/IT/CSD/CS)

Course Objectives:

* Effective use of Business Intelligence (BI) technology(Tableau) to apply data visualization
* To discern patterns and relationships in the data.
* To build Dash board applications.
* To communicate the results clearly and concisely.
* To be able to work with different formats of datasets.

Course Out comes: At the end of the course a student should be able to

* Understand How to import data into Tableau.
* Understand Tableau concepts of Dimensions and Measures.
* Develop Programs and understand how to map Visual Layouts and Graphical Properties.
* Create a Dash board that links multiple visualizations.
* Use graphical user interfaces to create Frames for providing solutions to real world problems.

Lab Problems:

1. Understanding Data, What is data, where to find data, Foundations for building Data Visualizations, Creating Your First visualization?
2. Getting started with Tableau Software using Data file formats, connecting your Data to Tableau, creating basic charts (line, bar charts, Tree maps),Using the Show me panel.
3. Tableau Calculations, Overview of SUM, AVR, and Aggregate features, Creating custom calculations and fields.
4. Applying new data calculations to your visualizations, Formatting Visualizations, Formatting Tools and Menus, Formatting specific parts of the view.
5. Editing and Formatting Axes, Manipulating Data in Tableau data, Pivoting Tableau data.
6. Structuring your data, Sorting and filtering Tableau data, Pivoting Tableau data.
7. Advanced Visualization Tools: Using Filters, Using the Detail panel, using the Size panels, customizing filters, Using and Customizing tool tips, Formatting your data with colors.
8. Creating Dashboards & amp; Storytelling, creating your first dashboard and Story, Design for different displays, adding interactivity to your Dashboard, Distributing & amp; Publishing your Visualization.
9. Tableau file types, publishing to Tableau Online, Sharing your visualizations, printing, and Exporting.
10. Creating custom charts, cyclical data and circular area charts, Dual Axischarts.

REFERENCEBOOKS:

1.   Microsoft Power BIcookbook,BrettPowell,2ndedition.

2.   R Programming for Data Science by Roger D. Peng (References)

3.   The Art of R Programming by Norman Matloff Cengage Learning India.

II YEAR
II SEMESTER SYLLABUS

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SM401MS/SM501MS: BUSINESS ECONOMICS & FINANCIAL ANALYSIS
(Common to IT/CSD)

Prerequisites: None

Course Objective: To learn the basic Business types, impact of the Economy on Business and Firms specifically. To analyze the Business from the Financial Perspective.

Course Outcome: The students will understand the various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. The Students can study the firm's financial position by analyzing the Financial Statements of aCompany.

UNIT – I
Introduction to Business and Economics:

Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT - II
Demand and Supply Analysis:

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.
Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.

UNIT - III
Production, Cost, Market Structures & Pricing:

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

Cost analysis: Types of Costs, Short run and Long run Cost Functions.

Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition.

Pricing: TypesofPricing,ProductLifeCyclebasedPricing,BreakEvenAnalysis,CostVolumeProfit Analysis.

UNIT -IV

Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.

UNIT - V

Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems).

Introduction to Fund Flow and Cash Flow Analysis (simple problems).

TEXT BOOKS:

1. D.D. Chaturvedi, S.L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd.2013.

2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill,2011.

3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e,Tata McGraw Hill Education Pvt. Ltd.2012.

REFERENCES:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press,2015.

2. S.N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting,5e, Vikas Publications,2013.

B.TECH II Year II Sem.   **L T PC**

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IT402PC/CS305PC: DISCRETE MATHEMATICS
(Common to CSD/CS)

Course Objectives:

- Introduces elementary discrete mathematics for computer science and engineering.
- Topics include formal logic notation, methods of proof, induction, sets, relations, algebraic structures, elementary graph theory, permutations and combinations, counting principles; recurrence relations and generating functions.

Course Outcomes:

- Understand and construct precise mathematical proofs
- Apply logic and set theory to formulate precise statements
- Analyze and solve counting problems on finite and discrete structures
- Describe and manipulate sequences
- Apply graph theory in solving computing problems

UNIT - I

Mathematical logic: Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

UNIT - II

Set theory: Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering, Functions.

UNIT - III

Algebraic Structures: Introduction, Algebraic Systems, Semi groups and Monoids, Lattices as Partially Ordered Sets, Boolean Algebra.

UNIT - IV

Elementary Combinatorics: Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutation with Constrained Repetitions, Binomial Coefficient, The Binomial and Multinomial Theorems, The Principle of Exclusion.

UNIT - V

Graph Theory: Basic Concepts, Isomorphism and Sub graphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi-graphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R. Manohar, McGraw-Hill, 1st ed.

2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe l. Mott, Abraham Kandel, Teodore P. Baker, Prentis Hall of India, 2nd ed.

REFERENCE BOOKS:

1. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, Pearson education, 5th edition.

2. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill publishing co.

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CS301PC/IT403PC: DATABASE MANAGEMENT SYSTEMS
(Common to CSE/CSD/CSC)

Prerequisites: A course on "Data Structures".

Course Objectives:

- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

Course Outcomes:

- Gain knowledge of fundamentals of DBMS, database design and normal forms
- Master the basics of SQL for retrieval and management of data.
- Be acquainted with the basics of transaction processing and concurrency control.
- Familiarity with database storage structures and access techniques

UNIT - I

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the E-R Model

UNIT - II

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views.

Relational Algebra**,** Tuple relational Calculus, Domain relational calculus.

UNIT - III

SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and

EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.

Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal form.

UNIT - IV

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

UNIT - V

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning, Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

TEXT BOOKS:

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, *Tata McGrawHill* 3rd Edition

2. Database System Concepts, Silberschatz, Korth, *McGraw Hill*, V Edition.

REFERENCES:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.

2. Fundamentals of Database Systems, Elmasri Navrate, *Pearson Education*

3. Introduction to Database Systems, C. J. Date, *Pearson Education*

4. Oracle for Professionals, The X Team, S.Shah and V.Shah, *SPD*.

5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.

6. Fundamentals of Database Management Systems, M. L. Gillenson, *Wiley Student* Edition.

B.TECH. II Year II Sem.   **L T   P C**

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AI404PC: DESIGN AND ANALYSIS OF ALGORITHMS
(common to CSD/CSM)

Prerequisites

- A course on "Computer Programming"
- A course on "Data Structures"

Course Objectives

- Introduces the notations for analysis of the performance of algorithms.
- Introduces the data structure disjoint sets.
- Describes major algorithmic techniques (divide-and-conquer, backtracking, dynamic programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate;
- Describes how to evaluate and compare different algorithms using worst-, average-, and best-case analysis.
- Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

Course Outcomes

- Ability to analyze the performance of algorithms
- Ability to choose appropriate data structures and algorithm design methods for a specified application
- Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs

UNIT - I

Introduction: Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation and Little oh notation.

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

UNIT - II

Disjoint Sets: Disjoint set operations, union and find algorithms

Backtracking: General method, applications, n-queen's problem, sum of subsets problem, graph coloring

UNIT - III

Dynamic Programming: General method, applications- Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem, Reliability design.

UNIT - IV

Greedy method: General method, applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT - V

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

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

TEXT BOOKS

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharan, University Press.

REFERENCES

1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C. Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R. Tamassia, John Wiley and sons.

B.Tech II Year II-Sem   **L T P C**

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CS405PC: SOFTWARE ENGINEERING
(Common to CSE/ IT/CSM /CSD/CS)

Course Objectives

- The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.
- Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams

Course Outcomes

- Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document(SRD).
- Identifyandapplyappropriatesoftwarearchitecturesandpatternstocarryouthighleveldesign of a system and be able to critically compare alternative choices.
- Willhaveexperienceand/orawarenessoftestingproblemsandwillbeabletodevelopasimple testing report

UNIT - I

Introduction to Software Engineering: The evolving role of software, changing nature of software, software myths.

A Generic view of process: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI), process patterns, process assessment, personal and team process models.

Process models: The waterfall model, incremental process models, evolutionary process models, the unified process.

UNIT - II

Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.

Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

System models: Context models, behavioral models, data models, object models, structured methods.

UNIT - III

Design Engineering: Design process and design quality, design concepts, the design model. **Creatinganarchitecturaldesign:**softwarearchitecture,datadesign,architecturalstylesandpatterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

UNIT - IV

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.

Product metrics: Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.

UNIT - V

Metrics for Process and Products: Software measurement, metrics for software quality.

Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan.

QualityManagement: Qualityconcepts,softwarequalityassurance,softwarereviews,formaltechnical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

TEXT BOOKS:

1. Software Engineering, A practitioner's Approach-Roger S. Pressman,6th edition, McGraw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.
3. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.

REFERENCES:

1. Software Engineering, an Engineering approach-James F.Peters, Witold Pedrycz, John Wiley.
2. Software Engineering principles and practice- Waman S Jawadekar, The Mc Graw-Hill Companies.
3. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.
4. Software Engineering by K K Agarwal and Yogesh Singh 3rd Edition, New Age International.

B.TECH II YearI Sem   **L T PC**
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CS306PC/IT406PC: DATA BASE MANAGEMENT SYSTEMS LAB
(Common to CSE/ CSD/CSC)

Pre-requisites:
- Pre-requisite of course "Database Management Systems"

Course Objectives:
- Introduce ER data model, database design and normalization
- Learn SQL basics for data definition and data manipulation

Course Outcomes:
- Design database schema for a given application and apply normalization
- AcquireskillsinusingSQLcommandsfordatadefinitionanddatamanipulation.
- Developsolutionsfordatabaseapplicationsusingprocedures,cursorsandtriggers

LIST OF EXPERIMENTS:
1. Concept design with E-R Model
2. Relational Model
3. Normalization
4. Practicing DDL commands
5. Practicing DML commands
6. Querying (using ANY, ALL, IN, Exists, NOTEXISTS, UNION, INTERSECT, Constraints etc.)
7. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
8. Triggers(Creation of insert trigger, delete trigger, update trigger)
9. Procedures
10. Usage of Cursors

TEXT BOOKS:
1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc GrawHill,3rdEdition
2. Database System Concepts, Silberschatz, Korth, McGrawHill, Vedition.

REFERENCESBOOKS:
1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Corone I7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, *Pearson Education*

3.   Introduction to Database Systems, C.J.Date, *Pearson Education*

4.   Oracle for Professionals, The X Team, S. Shah and V. Shah, *SPD*.

5.   Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.

6.   Fundamentals of Database Management Systems, M.L. Gillenson, Wiley Student Edition.

II Year B.Tech. CSD II Sem   **L T P C**

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DS407PC: DESIGN AND ANALYSIS OF ALGORITHMS LAB

Course Objectives

- To write programs in java to solve problems using divide and conquer strategy.
- To write programs in java to solve problems using backtracking strategy.
- To write programs in java to solve problems using greedy and dynamic programming techniques.

Course Outcomes

- Ability to write programs in java to solve problems using algorithm design techniques such as Divide and Conquer, Greedy, Dynamic programming, and Backtracking.

List of Experiments

1. Write a java program to implement Quick sort algorithm for sorting a list of integers in ascending order

2. Write a java program to implement Merge sort algorithm for sorting a list of integers in ascending order.

3. Write a java program to implement the dfs algorithm for a graph. ii) Write a. java program to implement the bfs algorithm for a graph.

4. Write a java programs to implement backtracking algorithm for the N-queens problem.

5. Write a java program to implement the backtracking algorithm for the sum of subsets problem.

6. Write a java program to implement the backtracking algorithm for the Hamiltonian Circuits problem.

7. Write a java program to implement greedy algorithm for job sequencing with deadlines.

8. Write a java program to implement Dijkstra's algorithm for the Single source shortest path problem.

9. Write a java program that implements Prim's algorithm to generate minimum cost spanning tree.

10. Write a java program that implements Kruskal's algorithm to generate minimum cost spanning tree

11. Write a java program to implement Floyd's algorithm for the all pairs shortest path problem.

12. Write a java program to implement Dynamic Programming algorithm for the 0/1 Knapsack problem.

13. Write a java program to implement Dynamic Programming algorithm for the Optimal Binary Search Tree Problem.

REFERENCE BOOKS

1. Data structures, Algorithms and Applications in java, 2nd Edition, S. Sahani, Universities Press.
2. Data structures and Algorithms in java, 3rd edition, A. Drozdek, Cengage Learning.
3. Data structures with Java, J. R. Hubbard, 2nd edition, Schaum's Outlines, TMH.
4. Data structures and algorithms in Java, 2nd Edition, R. Lafore, Pearson Education.
5. Data Structures using Java, D. S. Malik and P.S. Nair, Cengage Learning.

B.TECH II Year II Sem.   **L T PC**

3 003

CS408PC: SOFTWARE ENGINEERING LAB
(Common to CSE/ IT/CSM /CSD/CS)

Prerequisites

- A course on "Programming for Problem Solving"
- A course on "Database Management Systems"

Co-requisite

- A Course on "Software Engineering"

Course Objectives

- To have hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development.

Course Outcomes

- Ability to translate end-user requirements into system and software requirements
- Ability to generate a high-level design of the system from the software requirements
- Willhaveexperienceand/orawarenessoftestingproblemsandwillbeabletodevelopasimple testing report

List of Experiments

Do the following 8 exercises for any two projects given in the list of sample projects or anyother projects:

1. Development of problem statement.
2. PreparationofSoftwareRequirementSpecificationDocument,DesignDocumentsandTesting Phase related documents.
3. PreparationofSoftwareConfigurationManagementandRiskManagementrelateddocuments.
4. Study and usage of any Design phase CASE tool
5. Performing the Design by using any Design phase CASE tools.
6. Develop test cases for unit testing and integration testing
7. Develop test cases for various white box and black box testing techniques.

Sample Projects:

1. Passport automation System
2. Book Bank
3. Online Exam Registration
4. Stock Maintenance System
5. Online course reservation system

6.   E-ticketing

7.   Software Personnel Management System

8.   Credit Card Processing

9.   E-book management System.

10.   Recruitment system

TEXT BOOKS:

1.   SoftwareEngineering,Apractitioner'sApproach-RogerS.Pressman,6thedition,McGrawHill   International Edition.

2.   Software Engineering- Sommerville, 7th edition, Pearson Education.

3.   The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.

B.TECH II Year II Sem. **L T P C**

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CS409PC: Real-time Research Project\Societal Related Project
Common to CSE, IT, CSM, CSD and CSC

Guidelines will be followed as per JNTUH

B.Tech, II Year II Semester   **LTPC**

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MC412: ENVIRONMENTAL SCIENCE
(Common to CSD /CSC/ECE)

Course Objectives:

1.   Understanding the importance of ecological balance for sustainable development.

2.   Understanding the impacts of developmental activities and mitigation measures.

3.   Understanding the environmental policies and regulations

4.   Integrate human ecology and science of environmental problems.

5.   The effect of human activities on atmospheric pollution

Course Outcomes:

Based on this course, the Engineering graduate will

1.   Understand the harmonious co-existence in between nature and human being

2.   Recognize various problems related to environment degradation.

3.   Develop relevant research questions for environmental investigation.

4.   Generate ideas and solutions to solve environmental problems due to soil, air and water pollution.

5.   Evaluate and develop technologies based on ecological principles and environmental regulations which in turn help sin sustainable development.

UNIT-I

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Bio magnification, ecosystem resources and resilience, eco system value, services and carrying capacity.

UNIT-II

Natural Resources: Classification of Resources: Living and Non-Living resources, natural capital &Resources water resources: use and over utilization of surface and ground water, conflicts over-water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT-III

Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-si-

tu conservation. National Bio diversity act.

UNIT-IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Sources and types of pollution, drinking water quality standards. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. Pollution control technologies: Waste water Treatment methods: Primary, secondary and Tertiary.

Global Environmental Issues and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. Anthropogenic activities, influence on the occurrence of COVID-19Pandemic? How environment benefitted due to global lock down ari sing out of corona outbreak.

UNIT-V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act-1981, Water Act, Forest Act, Wild life Act, Municipal solid waste handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EI Astructure, methods of baseline data acquisition. Life cycle analysis (LCA), Towards Sustainable Future: Concept of Sustainable Development Goals, Population and its explosion, Resource exploitation, Crazy Consumerism, Environmental Education, Environmental Ethics, Concept of Green Building.

TEXT BOOKS:

1. EnvironmentalStudiesbyAnubhaKaushik,4thEdition,NewAgeInternationalPublishers.
2. TextbookofEnvironmentalStudiesforUndergraduateCoursesbyErachBharuchaforUniversityGrantsCommission.

REFERENCEBOOKS:

1. Text book of Environmental Science and Technology -Dr.M.Anji Reddy2007,B S Publications.
2. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
3. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela.2008PHILearningPvt.Ltd.
4. Environmental Science by Daniel B.Botkin & Edward A.Keller,Wiley INDIA edition.
5. Introduction to Environmental Science by Y. Anjaneyulu, BS Publications.
6. Environmental Studies by R. Rajagopalan, Oxford University Press.

B.Tech. II Year II Sem.   **L T P C**

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SD410PC: Skill Development Course-IV (Node JS/ React JS/ D jango)
(Common to CSE/IT/CSD/CS)

Prerequisites: Object Oriented Programming through Java, HTML Basics

Course Objectives:
- To implement the static web pages using HTML and do client side validation using JavaScript.
- To design and work with databases using Java
- To develop an end to end application using java full stack.
- To introduce Node JSimple mentation for server side programming.
- To experiment with single page application development using React.

Course Outcomes: At the end of the course, the student will be able to,
- Build a custom website with HTML, CSS, and Boots trap and little JavaScript.
- Demonstrate Advanced features of Java Script and learn about JDBC
- Develop Server–side implementation using Java technologies like
- Develop the server–side implementation using Node JS.
- Design a Single Page Application using React.

Exercises:
1. Build a responsive web application for shopping cart with registration, login, catalog and cart pages using CSS3features,flexand grid.
2. MaketheabovewebapplicationresponsivewebapplicationusingBootstrapframework.
3. UseJavaScriptfordoingclient–sidevalidationofthepagesimplementedinexperiment1andexperiment2.
4. Explore the features of ES6 like arrow functions, callbacks, promises, async/await. Implement an application for reading the weather information from openweathermap.org and display the information in the formofa graph on the web page.
5. Develop a java stand alone application that connects with the database (Oracle / mySql) and perform the CRUD operation on the database tables.
6. Create an xml for the bookstore. Validate the same using both DTD and XSD.
7. Design a controller with servlet that provides the interaction with application developed inexperiment1and the database created inexperiment5.
8. Maintaining the transactional history of any user is very important. Explore the various session tracking mechanism(Cookies, HTTP Session)
9. Create a custom server using http module and explore the other modules of Node JSlike OS, path, event.

10. Develop an express web application that can interact with REST API toper form CRUD operations on student data.(Use Postman)

11. For the above application create authorized end points using JWT(JSON Web Token).

12. Create a react application for the student management system having registration, login, contact, about pages and implement routing to navigate through these pages.

13. Create a service in react that fetches the weather information from openweathermap.org and the display the current and historical weather information using graphical representation usingchart.

14. Create a TODO application in react with necessary components and deploy it into git hub.

REFERENCEBOOKS:

1.   Jon Duckett, Beginning HTML, XHTML, CSS, and Java Script, Wrox Publications, 2010

2.   Bryan Basham, Kathy Sierra and Bert Bates, Head First Servlets and JSP, O'Reilly Media, 2nd Edition, 2008.

3.   Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo, Express,

III YEAR
I SEMESTER
SYLLABUS

IIIYEAR   **I-SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Cred-its
1	CS501PC	Computer Networks	3	0	0	3
2	DS502PC	Introduction to Data Science	3	1	0	4
3	CS503PC	Artificial Intelligence	3	0	0	3
4	DS504PC	Data Mining	3	0	0	3
5		Professional Elective-1	3	0	0	3
6	DS505PC	R Programming Lab	0	0	2	1
7	CS506PC	Artificial Intelligence Lab	0	0	2	1
8	DS507PC	Data Mining Using Python Lab	0	0	2	1
9	*MC510	Intellectual Property Rights	2	0	0	0
10	SD509PC	Skill Development Course (ETL-Kafka / Talend)	0	0	2	1
		Total Credits	**17**	**1**	**8**	**20**

*MC – Satisfied/Unsatisfied

IIIYEAR   **II-SEMESTER**

S.No.	Course Code	Course Title	L	T	P	Cred-its
1	IT601PC	Automata Theory and Compiler Design	3	1	0	4
2	CS602PC	Machine Learning	3	0	0	3
3	DS603PC	Big Data Analytics	3	0	0	3
4		Professional Elective-II	3	0	0	3
5		Open Elective-I / MOOCS	3	0	0	3
6	CS604PC	Machine Learning Lab	0	0	2	1
7	DS605PC	Big Data Analytics Lab	0	0	2	1
8	EN606HS	Advanced Communications Skills Lab	0	0	2	1
9	SD607PC	Industry Oriented Mini Project/ Internship / Skill Development Course -VI (UI Design -Flutter)	0	0	2	1
10	*MC609	Constitution of India	2	0	0	0
11	*MC610	Cyber Security	2	0	0	0
		Total Credits	**19**	**1**	**8**	**20**

*MC – Satisfied/Unsatisfied

Professional Electives

Professional Elective-I						
S.No.	Course Code	Course Title	L	T	P	C
1	DS511PE	Parallel and Distributed Computing	3	0	0	3
2	DS512PE	Information Storage Management	3	0	0	3
3	DS513PE	Data Science Applications	3	0	0	3
4	DS514PE	Industrial Robotics	3	0	0	3

Professional Elective-II						
S. No.	Course Code	Course Title	L	T	P	C
1	DS621PE	Cloud Computing	3	0	0	3
2	DS622PE	Design Patterns	3	0	0	3
3	DS623PE	Data Engineering	3	0	0	3
4	CS624PE	Information Retrieval Systems	3	0	0	3

Open Elective – I						
		Data Science	L	T	P	C
1	DS611OE	Web Programming	3	0	0	3
2	DS612OE	Introduction to data Science	3	0	0	3
3	DS613OE	Data Engineering	3	0	0	3
4	DS614OE	Java Programming	3	0	0	3

CMR ENGINEERING COLLEGE, HYDERABAD

B.TECH III Year I Sem.   **L T P C**

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CS501PC: COMPUTER NETWORKS
(Common to CSE/CSD)

Prerequisites

*   A course on "Programming for problem solving"
*   A course on "Data Structures"

Course Objectives

*   The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks.
*   Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers.

Course Outcomes

*   Gain the knowledge of the basic computer network technology.
*   Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
*   Obtain the skills of subnetting and routing mechanisms.
*   Familiarity with the essential protocols of computer networks, and how they can be applied in network design and implementation.

UNIT – I

Network hardware, Network software, OSI, TCP/IP Reference models, Comparison of OSI and TCP/IP Reference Models, Example Networks: ARPANET, Internet.

Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission:

Microwaves Transmission, Radio Transmission, Infrared Transmission and Light Transmission.

UNIT - II

Data link layer: Design issues, framing, Error detection and correction.

Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error- free channel, A simplex stop and wait protocol for noisy channel.

Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A Protocol using Selective Repeat.

Medium Access sub layer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, Data link layer switching.

UNIT - III

Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Link State routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the internet.

UNIT - IV

Transport Layer: Transport Services: services provided to the upper layers,Transport service Primitives Elements of Transport protocols, TCP and UDP protocols.

UNIT - V

Application Layer –Domain name system, SNMP, Electronic Mail; the WORLD WIDE WEB: Architectural over view, Static web pages, Dynamic web pages and Web Applications,   HTTP, Streaming audio and video.

TEXT BOOKS:

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/ PHI

REFERENCE BOOKS:

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

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B.TECH III Year I Sem. **L T P C**

3 1 0 4

DS502PC: INTRODUCTION TO DATA SCIENCE

Prerequisites

- A course on "Computer Oriented Statistical Methods"
- A course on "Data Mining"

Course Objectives:

- Learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration
- Understand the basic types of data and basic statistics
- Identify the importance of data reduction and data visualization techniques

Course Outcomes: After completion of the course, the student should be able to

- Understand basic terms what Statistical Inference means.
- Identify probability distributions commonly used as foundations for statistical modelling. Fit a model to data
- describe the data using various statistical measures
- utilize R elements for data handling
- perform data reduction and apply visualization techniques.

UNIT - I

Introduction: Definition of Data Science- Big Data and Data Science hype – and getting past the hype - Datafication - Current landscape of perspectives - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model – Over fitting.

Basics of R: Introduction, R- Environment Setup, Programming with R, Basic Data Types.

UNIT - II

Data Types & Statistical Description

Types of Data: Attributes and Measurement, What is an Attribute? The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes. Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Inter- quartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

UNIT - III

Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector sub setting, Matrices: Creating and Naming Matrices, Matrix Sub setting, Arrays, Class.

Factors and Data Frames: Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered

Factors, Comparing Ordered Factors, Introduction to Data Frame, subsetting of Data Frames, Extending Data Frames, Sorting Data Frames.

Lists: Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors

UNIT - IV

Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements. Iterative Programming in R: Introduction, While Loop, For Loop, Looping Over List.

Functions in R: Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

UNIT - V

Data Reduction: Overview of Data Reduction Strategies, Wavelet Transforms, Principal Components Analysis, Attribute Subset Selection.

Regression and Log-Linear Models: Parametric Data Reduction, Histograms, Clustering, Sampling, Data Cube Aggregation.

Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

TEXT BOOKS:

1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014

2. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.

3. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

REFERENCE BOOKS:

1. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.

2. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.

3. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.

4. Paul Teetor, "R Cookbook", O'Reilly, 2011.

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B.TECH III Year I Sem.   **L T P C**

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CS503PC: ARTIFICIAL INTELLIGENCE
(Common to CSE/CSD/IT)

Prerequisites:

1. Programming for problem solving, Data Structures.

Course Objectives:

•   To learn the distinction between optimal reasoning Vs. human like reasoning

•   To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.

•   To learn different knowledge representation techniques.

•   To understand the applications of AI, namely game playing, theorem proving, and machine learning.

Course Outcomes:

•   Understand search strategies and intelligent agents

•   Understand different adversarial search techniques

•   Apply propositional logic, predicate logic for knowledge representation

•   Apply AI techniques to solve problems of game playing, and machine learning.

UNIT - I

Introduction to AI, Intelligent Agents, problem-Solving Agents, Searching for Solutions, **Uninformed Search Strategies:** Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces

UNIT - II

Problem Solving by Search-II and Propositional Logic

Adversarial Search: Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions.

Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems. Propositional Logic: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

UNIT - III

Logic and Knowledge Representation

First-Order Logic: Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

UNIT - IV

Knowledge Representation: Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

UNIT - V

Uncertain knowledge and Learning Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use **Probabilistic Reasoning:** Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

TEXT BOOK:

1. Artificial Intelligence: A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

REFERENCE BOOKS:

1. Artificial Intelligence, 3rd Edn, E. Rich and K. Knight (TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henry Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education

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B.TECH III Year I Sem.   **L T P C**
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DS504PC: DATA MINING
(Common to CSE/CSD)

Pre-Requisites:

1.   Database Management System

2.   Probability and Statistics

Course Objectives:

•   Students will become acquainted with both the strengths and limitations of various data mining techniques like Association, Classification, Cluster and Outlier analysis.

Course Outcomes:

•   Understand the need of data mining and pre-processing techniques.

•   Perform market basket analysis using association rule mining.

•   Utilize classification techniques for analysis and interpretation of data.

•   Identify appropriate clustering and outlier detection techniques to handle complex data.

•   Understand the mining of data from web, text and time series data.

UNIT - I

Introduction to Data Mining: What Data mining? Kinds of Data, Knowledge Discovery process, Data Mining Functionalities, Kinds of Patterns, Major Issues in Data Mining. Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity, Data Pre-processing: Major Tasks in Data Pre-processing, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

UNIT - II

Association Analysis: Basic Concepts, Market Basket Analysis, Apriori Algorithm, FP-growth, From Association Analysis to Correlation Analysis, Pattern Mining in Multilevel Associations and Multidimensional Associations.

UNIT - III

Classification: Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Metrics for Evaluating Classifier Performance, Ensemble Methods, Multilayer Feed-Forward Neural Network, Support Vector Machines, k-Nearest-Neighbor Classifiers.

UNIT - IV

Cluster Analysis: Requirements for Cluster Analysis, Overview of Basic Clustering Methods, Partitioning Methods-k-Means, k-Medoids, Hierarchical Methods-AGENES, DIANA, BIRCH, Density-

Based Method-DBSCAN, Outlier Analysis: Types of Outliers, Challenges of Outlier Detection, and Overview of Outlier Detection Methods

UNIT - V

Advanced Concepts: Web Mining- Web Content Mining, Web Structure Mining, Web Usage Mining, Spatial Mining- Spatial Data Overview, Spatial Data Mining Primitives, Spatial Rules, Spatial Classification Algorithm, Spatial Clustering Algorithms, Temporal Mining- Modeling Temporal Events, Time Series, Pattern Detection, Sequences, Temporal Association Rules.

TEXT BOOKS:

1. Jiawei Han, Micheline Kamber, Jian Pei., Data Mining: Concepts and Techniques, 3rd Edition, Morgan Kaufmann/Elsevier, 2012.
2. Margaret H Dunham, Data Mining Introductory and Advanced Topics, 2nd Edition, Pearson Education, India, 2006.

REFERENCE BOOKS:

1. Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.
2. Pang-Ning Tan, Michael Steinbach, Anuj Karpatne and Vipin Kumar, Introduction to Data Mining, 2nd Edition, Pearson Education India, 2021.
3. Amitesh Sinha, Data Warehousing, Thomson Learning, India, 2007.

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B.TECH III Year I Sem. **L T P C**

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DS511PE: PARALLEL AND DISTRIBUTED COMPUTING
(Professional Elective – I)

Course Objectives:
- To learn core ideas behind parallel and distributed computing.
- To explore the methodologies adopted for parallel and distributed environments.
- To understand the networking aspects of parallel and distributed computing.
- To provide an overview of the computational aspects of parallel and distributed computing.
- To learn parallel and distributed computing models.

Course Outcomes:
- Explore the methodologies adopted for parallel and distributed environments.
- Analyze the networking aspects of Distributed and Parallel Computing.
- Explore the different performance issues and tasks in parallel and distributed computing.
- Tools usage for parallel and distributed computing.
- Understanding high performance computing techniques.

UNIT - I

Parallel and Distributed Computing— Introduction- Benefits and Needs- Parallel and Distributed Systems- Programming Environment- Theoretical Foundations - Parallel Algorithms— Introduction- Parallel Models and Algorithms- Sorting - Matrix Multiplication- Convex Hull- Pointer Based Data Structures.

UNIT - II

Synchronization- Process Parallel Languages- Architecture of Parallel and Distributed SystemsConsistency and Replication- Security- Parallel Operating Systems.

UNIT - III

Management of Resources in Parallel Systems- Tools for Parallel Computing- Parallel Database Systems and Multimedia Object Servers.

UNIT - IV

Networking Aspects of Distributed and Parallel Computing- Process- Parallel and Distributed Scientific Computing.

UNIT - V

High-Performance Computing in Molecular Sciences- Communication Multimedia Applications

for Parallel and Distributed Systems- Distributed File Systems.

TEXT BOOKS:

1. Jacek Błażewicz, et al., "Handbook on parallel and distributed processing", Springer Science & Business Media, 2013.
2. Andrew S. Tanenbaum, and Maarten Van Steen, "Distributed Systems: Principles and Paradigms". Prentice-Hall, 2007.

REFERENCE BOOKS:

1. George F.Coulouris, Jean Dollimore, and Tim Kindberg, "Distributed systems: concepts and design", Pearson Education, 2005.
2. Gregor Kosec and Roman Trobec, "Parallel Scientific Computing: Theory, Algorithms, and Applications of Mesh Based and Meshless Methods", Springer, 2015.

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B.TECH III Year I Sem.   **L T P C**
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DS512PE: INFORMATION STORAGE MANAGEMENT
(Professional Elective – I)

Course Objectives:

- To understand the basic components of Storage System Environment.
- To understand the Storage Area Network Characteristics and Component
- To examine emerging technologies including IP-SAN
- To describe the different backup and recovery topologies and their role in providing disaster recovery and business continuity capabi
- To understand the local and remote replication technologies.

Course Outcomes:

- Understand the logical and physical components of a Storage infrastructure
- Evaluate storage architectures, including storage subsystems, DAS, SAN, NAS, and CAS.
- Understand the various forms and types of Storage Virtualization
- Describe the different roles in providing disaster recovery and business continuity capabilities.
- Distinguish different remote replication technologies.

UNIT-I: Introduction to Storage Technology: Data proliferation and the varying value of data with time & usage, Sources of data and states of data creation, Data center requirements and evolution to accommodate storage needs, Overview of basic storage management skills and activities, The five pillars of technology, Overview of storage infrastructure components, Evolution of storage, Information Lifecycle Management concept, Data categorization within an enterprise, Storage and Regulations.

UNIT-II : Storage Systems Architecture: Intelligent disk subsystems overview, Contrast of integrated vs. Modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure-components, properties, performance, and specifications, Logical partitioning of disks, RAID & parity algorithms, hot sparing, Physical vs. logical disk organization, protection, and backend management, Array caching properties and algorithms, Front end connectivity and queuing properties, Frontend to host storage provisioning, mapping, and operation, Interaction of file systems with storage, Storage system connectivity protocols.

UNIT-III : Introduction to Networked Storage: JBOD, DAS, SAN, NAS, & CAS evolution, Direct Attached Storage (DAS) environments: elements, connectivity, & management, Storage Area Networks(SAN):elements & connectivity, Fibre Channel principles, standards, & network management principles, SAN management principles, Network Attached Storage (NAS): elements, connectivity options, connectivity protocols (NFS, CIFS, ftp), & management principles, IP SAN elements, standards (iSCSI, FCIP, iFCP), connectivity principles, security, and management principles, Content Addressable Storage (CAS):elements, connectivity options, standards, and management principles, Hybrid Storage –solutions overview including technologies like virtualization & appliances.

UNIT-IV : Introductions to Information Availability: Business Continuity and Disaster Recovery Basics, Local business continuity techniques, Remote business continuity techniques, Disaster Recovery principles & techniques. Managing & Monitoring: Management philosophies (holistic vs. system & component),Industry management standards (SNMP, SMI-S, CIM), Standard framework applications, Key management metrics (thresholds, availability, capacity, security, performance), Metric analysis methodologies & trend analysis, Reactive and proactive management best practices, Provisioning & configuration change planning, Problem reporting, prioritization, and handling techniques, Management tools overview.

UNIT-V : Securing Storage and Storage Virtualization: Define storage security. List the critical security attributes for information systems, describe the elements of a shared storage model and security extensions, Define storage security domains, List and analyze the common threats in each domain, Identify different virtualization technologies, describe block-level and file level virtualization technologies and processes.

TEXT BOOKS:

1. Marc Farley Osborne, "Building Storage Networks'', Tata McGraw Hill, 2001.

2. Robert Spalding and Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill, 2003.

3. Meeta Gupta, "Storage Area Network Fundamentals", Pearson Education Ltd., 2002.

REFERENCE BOOKS:

1. Gerald J Kowalski and Mark T Maybury," Information Storage Retrieval Systems theory &Implementation", BS Publications, 2000.

2. Thejendra BS, "Disaster Recovery & Business continuity", Shroff Publishers & Distributors,2006.

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B.TECH III Year I Sem. **L T P C**
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DS513PE: DATA SCIENCE APPLICATIONS
(Professional Elective – I)

Prerequisites

- A course on "Computer Oriented Statistical Methods"
- A course on "Data Mining"

Course Objectives:

- To learn Evolution of Data Science, Applications of Data Science in various fields and Data Security Issues.
- To learn various Data Collection Strategies
- To learn the Descriptive Statistics for Prediction and Decision Making.
- Outline the importance of data in making a business decision

Course Outcomes:

- Outline the importance of data in making a business decision
- Demonstrate the principles and Applications of data science,
- Use appropriate modeling and analyze techniques for data science problems, and Data Security Issues.
- Apply various Data Collection Strategies
- Solve the Descriptive Statistics problems for Prediction and Decision Making.

Unit – I: Introduction

Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues.

Unit – II: Data Collection and Data Pre-Processing

Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization.

Unit – III: Exploratory Data Analytics

Descriptive Statistics – Mean, Standard Deviation, Skewness and Kurtosis – Box Plots –Pivot Table – Heat Map – Correlation Statistics – ANOVA.

Unit – IV: Model Development

Simple and Multiple Regression – Model Evaluation using Visualization – Residual Plot –Distribution Plot – Polynomial Regression and Pipelines – Measures for In-sample Evaluation – Prediction and

Decision Making.

Unit – V: Model Evaluation

Generalization Error – Out-of-Sample Evaluation Metrics – Cross Validation – Overfitting –Under Fitting and Model Selection – Prediction by using Ridge Regression – Testing Multiple Parameters by using Grid Search.

TEXT BOOK:

1. Jojo Moolayil, "Smarter Decisions: The Intersection of IoT and Data Science", PACKT, 2016.

REFERENCES:

1. Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015.
2. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013
3. Raj, Pethuru, "Handbook of Research on Cloud Infrastructures for Big Data Analytics", IGIGlobal.

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B.TECH III Year I Sem.   **L T P C**
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DS514PE: INDUSTRIAL ROBOTICS
(Professional Elective – I)

Pre-requisites: Basic principles of Kinematics and mechanics

Course Objectives: The goal of the course is to familiarize the students with the concepts and techniques in robotic engineering, manipulator kinematics, dynamics andcontrol, chose, and incor- porate robotic technology in engineering systems.

- Make the students acquainted with the theoretical aspects of Robotics
- Enable the students to acquire practical experience in the field of Robotics through design projects and case studies.
- Make the students to understand the importance of robots in various fields of engineering.
- Expose the students to various robots and their operational details.
- Course Outcomes: At the end of the course, the student will be able to
- Understand the basic components of robots.
- Differentiate types of robots and robot grippers.
- Model forward and inverse kinematics of robot manipulators.
- Analyze forces in links and joints of a robot.
- Programme a robot to perform tasks in industrial applications.
- Design intelligent robots using sensors.

UNIT – I

Introduction: Automation and Robotics – An over view of Robotics – present and future applications. Components of the Industrial Robotics: common types of arms. Components, Architecture, num- ber of degrees of freedom – Requirements and challenges of end effectors, Design of end effectors, Precision of Movement: Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity.

UNIT – II

Motion Analysis: Basic Rotation Matrices, Equivalent Axis and Angle, Euler Angles, Composite Rotation Matrices. Homogeneous transformations as applicable to rotation and translation – problems. Manipulator Kinematics-H notation-H method of Assignment of frames-H Transformation Matrix, joint coordinates and world coordinates, Forward and inverse kinematics – problems on Industrial Robotic Manipulators.

UNIT – III

Differential transformation of manipulators, Jacobians – problems. Dynamics: Lagrange – Euler and Newton – Euler formations – Problems. Trajectory planning and avoidance of obstacles, path plan-

ning, Slew motion, joint interpolated mo- tion – straight line motion.

UNIT - IV

Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparison of Actuators, Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors, Tactile and Range sensors, Force and Torque sensors, End Effectors and Tools.

UNIT V

Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading-Processing - spot and continuous arc welding & spray painting - Assembly and Inspection. Robotic Programming Methods – Languages: Lead Through Programming, Textual Robotic Languages such as APT, MCL.

TEXT BOOKS:

1. Industrial Robotics / Groover M P /Mc Graw Hill

2. Introduction to Industrial Robotics / Ramachandran Nagarajan / Pearson

REFERENCE BOOKS:

1. Robot Dynamics and Controls / Spony and Vidyasagar / John Wiley

2. Robot Analysis and control / Asada, Slotine / Wiley Inter-Science

3. Robotics – Fu et al / TMH Publications.

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B.TECH III Year I Sem. **L T P C**

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DS505PC: R PROGRAMMING LAB

Course Objectives:

- Toexplorethefundamentalconceptsofdataanalytics.

- Tolearntheprinciplesandmethodsofstatisticalanalysis

- Discoverinteresting patterns,analyzesupervised and unsupervised models andestimate theac-curacyofthealgorithms.

- Tounderstandthevarioussearchmethodsandvisualizationtechniques.

CourseOutcomes: Aftercompletionofthiscoursestudentswillbeableto

- Implementofdataanalyticsforbusinessdecisionsandstrategy

- Carryoutdataanalysis/statisticalanalysis

- Tocarry out standard data visualization and formal inference proceduresList of Experi- ments:

1. IntroductiontoRtoolfordataanalytics

2. BasicStatisticsandVisualizationinR

3. K-meansClustering

4. ImplementAssociationRules

5. ImplementLinearRegression

6. ImplementLogisticRegression

7. ImplementNaiveBayesianClassifier

8. ImplementtheDecisionTrees

9. SimulatePrincipalcomponentanalysis

10. SimulateSingularValueDecomposition

TEXT BOOK:

1. Norman Matloff, The Art of R Programming, UC Davis 2009.

WEB REFERENCE:

1. https://www.r-project.org/

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B.TECH III Year I Sem.   **L T P C**

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CS506PC: ARTIFICIAL INTELLIGENCE LAB
(Common to CSE/CSD/IT)

Course objectives:

- To understand the concept of Artificial intelligence
- To understand different types of machine learning and models
- To understand the principles of pattern recognition with estimation and classification technique

Course Outcomes

- To apply various search algorithms of artificial intelligence.
- To apply knowledge representation and reasoning techniques.
- To apply different types of machine learning and models
- To design principles of pattern recognition with estimation and apply classification technique

List of Experiments

1. Write a Program to Implement Breadth First Search using Python.
2. Write a Program to Implement Depth First Search using Python
3. Write a program in prolog to solve Tower of Hanoi
4. Write a program in python to solve 8 Puzzle problems
5. Write a program in python to solve 4-Queens problem
6. Write a program in python to solve Traveling salesman problem
7. Write a program in python for Water jug problem
8. Write a Program to Implement Monkey Banana Problem using Python.
9. Write a Program to Implement Missionaries-Cannibals Problems using Python.
10. Write a Program to Implement N-Queens Problem using Python.

Lead Experiment

1. Write a Program to Implement Tic-Tac-Toe game using Python
2. Write a python program to implement simple Chatbot?

Text Book♥:

1. Learn Python the Hard Way: 3rd Edition. ...
2. Python Programming: An Introduction to Computer Science (3rd Edition)
3. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

Reference Books:

1. Automate The Boring Stuff with Python, 2nd Edition: Practical Programming For Total Beginners.

2. Python: The Complete Reference, Martin C. Brown (Author)

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B.TECH III Year I Sem.   **L T P C**

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DS507PC: DATA MINING USING PYTHON LAB
(Common to CSD)

Course Objectives:

* To obtain practical experience using data mining techniques on real world data sets.
* Emphasize hands-on experience working with all real data sets.

Course Outcomes:

* Ability to add mining algorithms as a component to the exiting tools
* Ability to apply mining techniques for realistic data.

List of Sample Problems:

WEEK- 1: Introduction to Python libraries for Data Mining :NumPy, SciPy, Pandas, Matplotlib, Scikit-LearnWrite a Python program to do the following operations:

Library: NumPy

    a. Create multi-dimensional arrays and find its shape and dimension
    b. Create a matrix full of zeros and ones
    c. Reshape and flatten data in the array
    d. Append data vertically and horizontally
    e. Apply indexing and slicing on array
    f. Use statistical functions on array - Min, Max, Mean, Median and Standard Deviation Subtasks: (Turn inyour answers to the following tasks)

WEEK-2: Write a Python program to do the following operations:
Library: NumPy

    a. Dot and matrix product of two arrays
    b. Compute the Eigen values of a matrix
    c. Solve a linear matrix equation such as $3 * x0 + x1 = 9$, $x0 + 2 * x1 = 8$
    d. Compute the multiplicative inverse of a matrix
    e. Compute the rank of a matrix
    f. Compute the determinant of an array

WEEK-3: UNDERSTANDING DATA

Write a Python program to do the following operations:

Data set: brain_size.csv, Library: Pandas

    a. Loading data from CSV file

    b. Compute the basic statistics of given data - shape, no. of columns, mean

    c. Splitting a data frame on values of categorical variables

    d. Visualize data using Scatter plot

WEEK-4: CORRELATION MATRIX

Write a python program to load the dataset and understand the input data

Dataset: Pima Indians Diabetes Dataset, Library : Scipy

    a. Load data, describe the given data and identify missing, outlier data items

    b. Find correlation among all attributes

    c. Visualize correlation matrix

WEEK -5 DATA PREPROCESSING – HANDLING MISSING VALUES

Write a python program to impute missing values with various techniques on given dataset.

    a) Remove rows/ attributes

    b) Replace with mean or mode

    c) Write a python program to perform transformation of data using Discretization (Binning) and normalization(MinMaxScaler or MaxAbsScaler) on given dataset.

WEEK -6 ASSOCIATION RULE MINING- APRIORI

Write a python program to find rules that describe associations by using Apriori algorithm between differentproducts given as 7500 transactions at a French retail store.

Libraries: NumPy, SciPy, Matplotlib, Pandas

    a) Dataset:https://drive.google.com/file/d/1y5DYn0dGoSbC22xowBq2d4po6h1JxcTQ/view?usp=sharing a)
      Display top 5 rows of data

    b) Find the rules with min_confidence : .2, min_support= 0.0045, min_lift=3, min_length=2

WEEK -7 CLASSIFICATIONS – LOGISTIC REGRESSION

Classification of Bank Marketing Data The data is related with direct marketing campaigns of a Portuguese banking institution. The marketing campaigns were based on phone calls. Often, more than one contact to thesame client was required, in order to access if the product (bank term deposit) would be ('yes') or not ('no') subscribed. The dataset provides the bank customers information. It includes 41,188 records and 21 fields. The classification goal is to predict whether the client will subscribe (1/0) to a term deposit (variable y).

Libraries: Pandas, NumPy, Sklearn, Seaborn

Write a python program to
- a. Explore data and visualize each attribute
- b.Predict the test set results and find the accuracy of the model
- c. Visualize the confusion matrix d) Compute precision, recall, F-measure and support

WEEK-8 CLASSIFICATION - KNN

Dataset: The data set consists of 50 samples from each of three species of Iris: Iris setosa, Iris virginica andIris versicolor. Four features were measured from each sample: the length and the width of the sepals and petals, in centimetres.

Libraries: import numpy as np

Write a python program to

a. Calculate Euclidean Distance.

b.Get Nearest Neighbors

c. Make Predictions.

WEEK-9 CLASSIFICATION - DECISION TREES

Write a python program

- a. to build a decision tree classifier to determine the kind of flower by using given dimensions.
- b. training with various split measures(Gini index, Entropy and Information Gain)
- c. Compare the accuracy

WEEK -10 CLUSTERING – K-MEANS

Predicting the titanic survive groups: The sinking of the RMS Titanic is one of the most infamous shipwrecksin history. On April 15, 1912, during her maiden voyage, the Titanic sank after colliding with an iceberg, killing 1502 out of 2224 passengers and crew. This sensational tragedy shocked the international community and led to better safety regulations for ships. One of the reasons that the shipwreck led to such loss of life wasthat there were not enough lifeboats for the passengers and crew. Although there was some element of luck involved in surviving the sinking, some groups of people were more likely to survive than others, such as women, children, and the upper-class.

Libraries: Pandas, NumPy, Sklearn, Seaborn, Matplotlib

Write a python program

a) To perform preprocessing

b) To perform clustering using k-means algorithm to cluster the records into two i.e. the ones who survived and the ones who did not.

WEEK -11 CLASSIFICATIONS – BAYESIAN NETWORK

Predicting Loan Defaulters: A bank is concerned about the potential for loans not to be repaid. If previous loan default data can be used to predict which potential customers are liable to have problems repaying loans, these "bad risk" customers can either be declined a loan or offered alternative products. Dataset: The stream named bayes_bankloan.str, which references the data file named bankloan.sav. These files are available fromthe Demos directory of any IBM® SPSS® Modeler installation and can be accessed from the IBM SPSS Modeler program group on the Windows Start menu.

The bayes_bankloan.str file is in the streams directory.

a. Build Bayesian network model using existing loan default data

b. Visualize Tree Augmented

Naïve Bayes model

a) Predict potential future defaulters, and looks at three different Bayesian network model types (TAN,Markov, Markov-FS) to establish the better predicting model.

WEEK-12 CLASSIFICATION – SUPPORT VECTOR MACHINES (SVM)

A wide dataset is one with a large number of predictors, such as might be encountered in the field of bioinformatics (the application of information technology to biochemical and biological data).

A medical researcher has obtained a dataset containing characteristics of a number of human cell samples extracted from patients who were believed to be at risk of developing cancer. Analysis of the original data showed that many of the characteristics differed significantly between benign and malignant samples.

Dataset: The stream named svm_cancer.str, available in the Demos folder under the streams subfolder. The data file is cell_samples. data. The dataset consists of several hundred human cell sample records, each of which contains the values of a set of cell characteristics. a) Develop an SVM model that can use the values ofthese cell characteristics in samples from other patients to give an early indication of whether their samples might be benign or malignant.

Hint: Refer UCI Machine Learning Repository for data set.

References:

1.   https://www.dataquest.io/blog/sci-kit-learn-tutorial/

2.   https://www.ibm.com/support/knowledgecenter/en/SS3RA7_sub/modeler_tutorial_ddita/modeler_tutorial_d dita-gentopic1.html

3.   https://archive.ics.uci.edu/ml/datasets.php

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B.TECH III Year I Sem.   **L T P C**

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*MC510: INTELLECTUAL PROPERTY RIGHTS
(Common to CSE/CSD)

UNIT – I

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations,agencies and treaties, importance of intellectual property rights.

UNIT – II

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter,selecting, and evaluating trade mark, trade mark registration processes.

UNIT – III

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights toperform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT – IV

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of tradesecrets, protection for submission, trade secrete litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

UNIT – V

New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits.

International overview on intellectual property, international – trade mark law, copy right law, internationalpatent law, and international development in trade secrets law.

TEXT BOOKS & REFERENCES:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGrawHill Publishing company ltd

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B.TECH III Year I Sem.   **L T P C**

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SD509PC: SKILL DEVELOPMENT COURSE (ETL-Kafka / Talend)

Course Objectives:

1.   Thecourseis intendedto obtain hands-onexperiencein Kafka.

2.   Intendedtoprovidepracticalexposureof kafkaclusters andDataReplication.

Course Outcomes:

1.   Applythe KnowledgeofBigdata .

2.   Gainpracticalexperienceofkafkaclusters..

3.   Implementkafka connecters.

4.   Studyand implementation ofkafkaproducer .

5.   Learnaboutkafka monitoring.

6.   Studyandimplementation ofkafkaoperationsandperformanceTuning.

Syllabus:

1.   Installingand RunningKafka.

2.   ConfiguringMulti-Broker Kafka

3.   Exploring Zookeeper.

4.   Overviewofkafka consumers

5.   UsingKafkawith Docker.

6.   DevelopingKafka Producer.

7.   SendingMessageswith Callback.

8.   Kafkamonitoringand schema Registry.

9.   Kafkastreams andkafka connectors.

10.   Integrationofkafkawithstorm.

11.   Kafkaintegrationwithsparkandflume.

12.   KafkaApplicationasConsumerandProducer.

13.   Word Count Per Record

TEXT BOOKS:

1.   NehaNarkhede,GwenShapira),ToddPalino,Kafka–TheDefinitiveGuide:Real-timedataand streamprocessing at scale,2017.

2.   BillBejeck,KafkaStreamsinActionReal-timeAppsandMicroserviceswiththeKafkaStreams API,2018.

III YEAR
II SEMESTER
SYLLABUS

CMR ENGINEERING COLLEGE, HYDERABAD

B.TECH III Year II Sem.   **L T P C**

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IT601PC: AUTOMATA THEORY AND COMPILER DESIGN
(Common to CSD,IT)

Course Objectives

- To introduce the fundamental concepts of formal languages, grammars and automata theory.
- To understand deterministic and non-deterministic machines and the differences between decidability and undecidability.
- Introduce the major concepts of language translation and compiler design and impart the knowledge of practical skills necessary for constructing a compiler.
- Topics include phases of compiler, parsing, syntax directed translation, type checking use of symbol tables, intermediate code generation

Course Outcomes

- Able to employ finite state machines for modeling and solving computing problems.
- Able to design context free grammars for formal languages.
- Able to distinguish between decidability and undecidability.
- Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
- Acquire skills in using lex tool and design LR parsers

UNIT - I

Introduction to Finite Automata: Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.

Nondeterministic Finite Automata: Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions.

Deterministic Finite Automata: Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with €-transitions to NFA without €-transitions. Conversion of NFA to DFA

UNIT - II

Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.

Pumping Lemma for Regular Languages: Statement of the pumping lemma, Applications of the Pumping Lemma.

Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Parse Trees, Ambiguity in Grammars and Languages.

UNIT - III

Push Down Automata: Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state

Turing Machines:

Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine

Undecidability:

Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines

UNIT - IV

Introduction: The structure of a compiler

Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical- Analyzer Generator Lex

Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom- Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers

UNIT - V

Syntax-Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Syntax- Directed Translation Schemes, Implementing L-Attributed SDD's.

Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code

Run-Time Environments: Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management

TEXT BOOKS:

1.   Introduction to Automata Theory, Languages, and Computation, 3rd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.

2.   Theory of Computer Science- Automata languages and computation, Mishra and Chandrashekaran, 2nd Edition, PHI.

REFERENCE BOOKS:

1.   Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, 2nd Edition, Pearson.

2.   Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson.

3.   Introduction to Languages and The Theory of Computation, John C Martin, TMH.

4.   lex & yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly

5.   Compiler Construction, Kenneth C. Louden, Thomson. Course Technology.

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CS602PC: MACHINE LEARNING
(Common to CSE/CSD/CSM)

Prerequisites

- Data Structures
- Knowledge on statistical methods

Course Objectives

- This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
- To understand computational learning theory.
- To study the pattern comparison techniques.

Course Outcomes

- Understand the concepts of computational intelligence like machine learning
- Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
- Understand the Neural Networks and its usage in machine learning application.

UNIT - I

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning ,Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias.

Decision Tree Learning – Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

UNIT - II

Artificial Neural Networks-1– Introduction, neural network representation, appropriate problems for network learning, perceptions, multilayer networks and the back-propagation algorithm.

Artificial Neural Networks-2- Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks.

Evaluation Hypotheses – Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.

UNIT - III

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm.

Instance-Based Learning- Introduction, *k*-nearest neighbor algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

UNIT - IV

Genetic Algorithms – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.

Learning Sets of Rules – Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL

Reinforcement Learning – Introduction, the learning task, *Q*–learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

UNIT - V

Analytical Learning-1- Introduction, learning with perfect domain theories: PROLOG-EBG, remarks on explanation-based learning, explanation-based learning of search control knowledge.

TEXT BOOKS:

1. Machine Learning – Tom M. Mitchell, - MGH

REFERENCE BOOK:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis

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DS603PC: BIG DATA ANALYTICS

Course Objectives:

- The purpose of this course is to provide the students with the knowledge of Big data Analytics principles and techniques.
- This course is also designed to give an exposure of the frontiers of Big data Analytics

Courses Outcomes:

- Ability to explain the foundations, definitions, and challenges of Big Data and various Analytical tools.
- Ability to program using HADOOP and Map reduce, NOSQL
- Ability to understand the importance of Big Data in Social Media and Mining.

UNIT - I

Introduction to Big Data: Big Data and its Importance – Four V's of Big Data – Drivers for Big Data – Introduction to Big Data Analytics – Big Data Analytics applications.

UNIT - II

Big Data Technologies: Hadoop's Parallel World – Data discovery – Open source technology for Big Data Analytics – cloud and Big Data –Predictive Analytics – Mobile Business Intelligence and Big Data

UNIT - III

Introduction Hadoop: Big Data – Apache Hadoop & Hadoop Eco System – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization.

UNIT - IV

Hadoop Architecture: Hadoop: RDBMS Vs Hadoop, Hadoop Overview, Hadoop distributors, HDFS, HDFS Daemons, Anatomy of File Write and Read., Name Node, Secondary Name Node, and Data Node, HDFS Architecture, Hadoop Configuration, Map Reduce Framework, Role of HBase in Big Data processing, HIVE, PIG.

UNIT - V

Data Analytics with R Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering, Social Media Analytics, Mobile Analytics, Big Data Analytics with BigR.

TEXT BOOKS:

1. Big Data Analytics, Seema Acharya, Subhasini Chellappan, Wiley 2015.

2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for To-day's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiely CIO Series, 2013.

3. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O□Reilly Media, 2012.

4. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

REFERENCE BOOKS:

1. Big Data and Business Analytics, Jay Liebowitz, Auerbach Publications, CRC press (2013)

2. Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop, Tom Plunkett, Mark Hornick, McGraw-Hill/Osborne Media (2013), Oracle press.

3. Professional Hadoop Solutions, Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, Wiley, ISBN: 9788126551071, 2015.

4. Understanding Big data, Chris Eaton, Dirk deroos et al. McGraw Hill, 2012.

5. Intelligent Data Analysis, Michael Berthold, David J. Hand, Springer, 2007.

6. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Bill Franks, 1st Edition, Wiley and SAS Business Series, 2012.

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DS621PE: CLOUD COMPUTING

(Professional Elective –II)

Pre-requisites: Courses on Computer Networks, Operating Systems, Distributed Systems.

Course Objectives:

• This course provides an insight into cloud computing.

• Topics covered include- distributed system models, different cloud service models, service- oriented architectures, cloud programming and software environments, resource management.

Course Outcomes:

• Ability to understand various service delivery models of a cloud computing architecture.

• Ability to understand the ways in which the cloud can be programmed and deployed.

• Understanding cloud service providers.

UNIT - I

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

UNIT - 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.

UNIT - III

Cloud Computing Architecture and Management: Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

UNIT - IV

Cloud Service Models: Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

UNIT V

Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue ,service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud, SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjra soft, Aneka Platform.

TEXT BOOK:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

REFERENCE BOOKS:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.

2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.

3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp 2011.

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DS622PE: DESIGN PATTERNS
(Professional Elective –II)

Prerequisites

• A Course on Software Engineering"

• A Course on "Object Oriented Programming Through Java"

Course Objectives:

• The aim of the course is to appreciate the idea behind Design Patterns in handling common problems faced during building an application

• This course covers all pattern types from creational to structural, behavioral to concurrency and highlights the scenarios when one pattern must be chosen over others.

Course Outcomes:

• Create software designs that are scalable and easily maintainable

• Understand the best use of Object Oriented concepts for creating truly OOP programs

• Use creational design patterns in software design for class instantiation

• Use structural design patterns for better class and object composition

• Use behavioral patterns for better organization and communication between the objects

• Use refactoring to compose the methods for proper code packaging

• Use refactoring to better organize the class responsibilities of current code

UNIT - I

Introduction: What is a design pattern? design patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

UNIT - II

Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary

UNIT - III

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

UNIT - IV

Structural Pattern: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy

UNIT - V

Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template Method, Visitor.

TEXT BOOK:

1. Design Patterns, Erich Gamma, Pearson Education

REFERENCE BOOKS:

1.   Pattern's in Java, Vol –I, Mark Grand, Wiley Dream Tech.
2.   Patterns in Java, Vol-II, Mark Grand, Wiley Dream Tech.
3.   Java Enterprise Design Patterns Vol-III, Mark Grand, Wiley Dream Tech.
4.   Head First Design Patterns, Eric Freeman, O'reily publications

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DS623PE: DATA ENGINEERING

(Professional Elective –II)

CourseObjective:

- ToprovideanoverviewofthebasicconceptsofDatamodeling.
- Thestudentwillunderstandtherelationalandnonrelationaldatabasedesignanddata basecluster-ingtools.
- Thestudentwillunderstandmachinelearning

CourseOutcome:

- MasterthebasicofSQLforretrievalandmanagementofdata.
- ApplyRelationalandnon-relationaldatabasedesign
- Applydatabaseclusteringtoolsandtechniques

UNIT1:DataModelingIntroduction

Typesofdatabases,datastoragetechniques,createatableinmySQLandApacheCassandra.

Usearelationaldatabase,differencebetweenOLAPandOLTPdatabases.Createnormalizeddatata-ble-sandImplementdenormalizedschemas(e.g.STAR,Snowflake,andFACTconstilationschemas)NoSQLdatabasesvs.RDBMS,CreateaNoSQLdatabaseinApacheCassandraDataEngineervs. Data Scientists, Basic Data Engineering Skills,

UNIT2:Relationaland non-relationaldatabasedesign

Data Warehouse architecture, ETL process, to denormalize a database (3NF to Star). Create an OLAP cube from facts and dimensions andlearn to compare column vs. row oriented approach-es.createanAWSaccountandunderstandtheirservices.SetupAmazonS3,IAM,VPC,EC2, RDSPost-greSQL,Azure,IBM,GoogleCloudbasics.

BigData:Whatisbigdata?datasciencevsdataanalytics,the4VsofBigData,WhyBigData? The Problem-with ETL Scaling Up, Scaling Out, DataWarehouse vs. Data Lake.

UNIT3:Databaseclusteringtoolsandtechniques

Hadoop: What is Hadoop? What makes Hadoop so popular, Hadoop Ecosystem Components, Docker: Docker and usage PreconfiguredImages, KubernetesContainerDeployment, Docker micro services,Kubernetes,Dockercontainerorchestration,RESTAPIs,HTTPPost/Get ,APIDesign Im- ple-mentation.

UNIT4:Databases:SQLDatabases,DatabaseDesign,SQLQueriesStoredProcedures, ODBC/JDBC-ServerConnections, NoSQL Stores, KeyValue Stores (HBase), Document Store HDFS, Document Store MongoDB, Hive Warehouse, Impala, Kudu, Time Series Databases, MPPDatabases(Green-plum).

DataProcessing/Analytics–Frameworks,

MapReduce,ApacheSpark,SparkonYARN,RDD,DataFrame,SparkcodingwithScala,Spark codingwithPython,SparkSQL.

UNIT5:MachineLearning:

Trainingandapplyingmodels,deeplearning,MachineLearninginproduction,DataVisualiza- tion, Android & IOS, design APIs for mobile apps,

Webservers:Tomcat,Jetty,NodeRED,andReact.BusinessIntelligenceTools:

Tableau, PowerBI, Quliksense, Device Management, digital twin, Active Directory, Building A Data PlatformExample, Lambda Architecture, Kappa Architecture, Kappa Architecture with Kudu, Data Architecture, Analytics Requirements for Streaming, Analytics Requirements For BatchProcessing,-DataVisualization,

TEXTBOOK:

1.   The Data Engineering Cook book by Andreas Kretz
2.   DW2.0–TheArchitecturefortheNextGenerationofDataWarehousing b y The Father of Data Warehousing W.H.Inmon
3.   Learning Spark by Holden Karau
4.   Spark:TheDefinitiveGuide:BigDataProcessingMadeSimplebyBillChambers

REFERENCE:

1.   BigData,BlackBook:CoversHadoop2,MapReduce,Hive,YARN,Pig,R,andDataVisu- alization
2.   Docker for Data Science: Building Scalable and Extensible Data Infrastructure Around theJupyterNotebook Server December 2017 by Joshua Cook .

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CS624PE: INFORMATION RETRIEVAL SYSTEMS
(Professional Elective –II)
(Common to CSE/CSD)

Prerequisites:

1.   Data Structures

Course Objectives:

* To learn the important concepts and algorithms in IRS
* To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems.

Course Outcomes:

* Ability to apply IR principles to locate relevant information large collections of data
* Ability to design different document clustering algorithms
* Implement retrieval systems for web search tasks.
* Design an Information Retrieval System for web search tasks.

UNIT - I

Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses

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

UNIT - II

Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction

Data Structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models

UNIT - III

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages

Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters

UNIT - IV

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext

Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies

UNIT - V

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems

Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval

TEXT BOOK:

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer

REFERENCE BOOKS:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Information Storage & Retrieval By Robert Korfhage – John Wiley & Sons.
3. Modern Information Retrieval By Yates and Neto Pearson Education.

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DS611OE: WEB PROGRAMMING
(Open Elective –I)

Course Objectives: The student should be able to:

•   Understand the technologies used in Web Programming.

•   Know the importance of object-oriented aspects of Scripting.

•   Understand creating database connectivity using JDBC.

•   Learn the concepts of web-based application using sockets.

Course Outcomes: Upon Completion of the course, the students will be able to

•   Design web pages.

•   Use technologies of Web Programming.

•   Apply object-oriented aspects to Scripting.

•   Create databases with connectivity using JDBC.

•   Build web-based application using sockets.

UNIT - I

SCRIPTING: Web page Designing using HTML, Scripting basics- Client side and server-side script-ing. Java Script-Object, names, literals, operators and expressions- statements and features- events - windows -documents - frames - data types - built-in functions- Browser object model - Verifying forms - HTML5-CSS3- HTML 5 canvas - Web site creation using tools.

UNIT – II

JAVA: Introduction to object-oriented programming-Features of Java – Data types, variables and arrays

– Operators – Control statements – Classes and Methods – Inheritance. Packages and Interfaces – Exception Handling – Multithreaded Programming – Input/ Output – Files – Utility Classes – String Handling.

UNIT – III

JDBC: JDBC Overview – JDBC implementation – Connection class – Statements - Catching Data-base Results, handling database Queries. Networking– Inet Address class – URL class- TCP sockets – UDP sockets, Java Beans –RMI.

UNIT – IV

APPLETS: Java applets- Life cycle of an applet – Adding images to an applet – Adding sound to an applet. Passing parameters to an applet. Event Handling. Introducing AWT: Working with Windows Graphics and Text. Using AWT Controls, Layout Managers and Menus. Servlet – life cycle of a servlet.

The Servlet API, Handling HTTP Request and Response, using Cookies, Session Tracking. Introduction to JSP.

UNIT – V

XML AND WEB SERVICES: Xml – Introduction-Form Navigation-XML Documents- XSL – XSLT- Web services-UDDI-WSDL-Java web services – Web resources.

TEXT BOOKS:

1.   Harvey Deitel, Abbey Deitel, Internet and World Wide Web: How To Program 5th Edition.

2.   Herbert Schildt, Java - The Complete Reference, 7th Edition. Tata McGraw- Hill Edition.

3.   Michael Morrison XML Unleashed Tech media SAMS.

REFERENCE BOOKS:

1.   John Pollock, Java script - A Beginners Guide, 3rd Edition –- Tata McGraw-Hill Edition.

2.   Keyur Shah, Gateway to Java Programmer Sun Certification, Tata McGraw Hill, 2002.

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DS612OE: INTRODUCTION TO DATA SCIENCE

(Open Elective –I)

Course Objectives:

1. Learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration

2. Understand the basic types of data and basic statistics

3. Identify the importance of data reduction and data visualization techniques

Course Outcomes: After completion of the course, the student should be able to

1. Understand basic terms what Statistical Inference means.

2. Identify probability distributions commonly used as foundations for statistical modelling. Fit a model to data

3. describe the data using various statistical measures

4. utilize R elements for data handling

5. perform data reduction and apply visualization techniques.

UNIT - I

Introduction: Definition of Data Science- Big Data and Data Science hype – and getting past the hype

- Datafication - Current landscape of perspectives - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model – Over fitting. **Basics of R:** Introduction, R- Environment Setup, Programming with R, Basic Data Types.

UNIT - II

Data Types & Statistical Description

Types of Data: Attributes and Measurement, What is an Attribute? The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes. Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Inter- quartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

UNIT - III

Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector sub setting, **Matrices:** Creating and Naming Matrices, Matrix Sub setting, Arrays, Class. **Factors and Data Frames:** Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, subsetting of Data Frames, Extending Data Frames, Sorting Data Frames.

Lists: Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating List

Elements, Merging Lists, Converting Lists to Vectors

UNIT - IV

Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements. **Iterative Programming in R:** Introduction, While Loop, For Loop, Looping Over List. **Functions in R:** Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

UNIT - V

Data Reduction: Overview of Data Reduction Strategies, Wavelet Transforms, Principal Components Analysis, Attribute Subset Selection, Regression and Log-Linear Models: Parametric Data Reduction, Histograms, Clustering, Sampling, Data Cube Aggregation. **Data Visualization:** Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

TEXT BOOKS:

1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014

2. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.

3. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

REFERENCE BOOKS:

1. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.

2. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.

3. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.

4. Paul Teetor, "R Cookbook", O'Reilly, 2011.

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DS613OE: DATA ENGINEERING
(OPEN ELECTIVE –I)

CourseObjective:

- ToprovideanoverviewofthebasicconceptsofDatamodeling.
- Thestudentwillunderstandtherelationalandnonrelationaldatabasedesignanddata   basecluster-ingtools.
- Thestudentwillunderstandmachinelearning

CourseOutcome:

- MasterthebasicofSQLforretrievalandmanagementofdata.
- ApplyRelationalandnon-relationaldatabasedesign
- Applydatabaseclusteringtoolsandtechniques

UNIT1:DataModelingIntroduction

Typesofdatabases,datastoragetechniques,createatableinmySQLandApacheCassandra.

Usearelationaldatabase,differencebetweenOLAPandOLTPdatabases.Createnormalizeddatata-ble-sandImplementdenormalizedschemas(e.g.STAR,Snowflake,andFACTconstilationschemas)NoSQLdatabasesvs.RDBMS,CreateaNoSQLdatabaseinApacheCassandraDataEngineervs. Data Scientists, Basic Data Engineering Skills,

UNIT2:Relationaland non-relationaldatabasedesign

Data Warehouse architecture, ETL process, to denormalize a database (3NF to Star). Create an OLAP cube from facts and dimensions andlearn to compare column vs. row oriented approach-es.createanAWSaccountandunderstandtheirservices.SetupAmazonS3,IAM,VPC,EC2,   RDSPost-greSQL,Azure,IBM,GoogleCloudbasics.

BigData:Whatisbigdata?datasciencevsdataanalytics,the4VsofBigData,WhyBigData? The Problem-with ETL Scaling Up, Scaling Out, DataWarehouse vs. Data Lake.

UNIT3:Databaseclusteringtoolsandtechniques

Hadoop: What is Hadoop? What makes Hadoop so popular, Hadoop Ecosystem Components, Docker: Docker and usage PreconfiguredImages, KubernetesContainerDeployment, Docker micro services,Kubernetes,Dockercontainerorchestration,RESTAPIs,HTTPPost/Get ,APIDesign Im- ple-mentation.

UNIT4:Databases:SQLDatabases,DatabaseDesign,SQLQueriesStoredProcedures,   ODBC/JDBC-ServerConnections, NoSQL Stores, KeyValue Stores (HBase), Document Store HDFS, Document Store MongoDB, Hive Warehouse, Impala, Kudu, Time Series Databases, MPPDatabases(Green-

plum).

DataProcessing/Analytics–Frameworks,

MapReduce,ApacheSpark,SparkonYARN,RDD,DataFrame,SparkcodingwithScala,Spark codingwithPython,SparkSQL.

UNIT5:MachineLearning:

Trainingandapplyingmodels,deeplearning,MachineLearninginproduction,DataVisualiza- tion, Android & IOS, design APIs for mobile apps,

Webservers:Tomcat,Jetty,NodeRED,andReact.BusinessIntelligenceTools:

Tableau, PowerBI, Quliksense, Device Management, digital twin, Active Directory, Building A Data PlatformExample, Lambda Architecture, Kappa Architecture, Kappa Architecture with Kudu, Data Architecture, Analytics Requirements for Streaming, Analytics Requirements For BatchProcessing,-DataVisualization,

TEXTBOOK:

1.   The Data Engineering Cook book by Andreas Kretz
2.   DW2.0–TheArchitecturefortheNextGenerationofDataWarehousing b y The Father of Data Warehousing W.H.Inmon
3.   Learning Spark by Holden Karau
4.   Spark:TheDefinitiveGuide:BigDataProcessingMadeSimplebyBillChambers

REFERENCE:

1.   BigData,BlackBook:CoversHadoop2,MapReduce,Hive,YARN,Pig,R,andDataVisu- alization
2.   Docker for Data Science: Building Scalable and Extensible Data Infrastructure Around theJupyterNotebook Server December 2017 by Joshua Cook .

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DS614OE: JAVA PROGRAMMING

(Open Elective –I)

Course Objectives:

- To introduce the object-oriented programming concepts.
- To understand object-oriented programming concepts, and apply them in solving problems.
- To introduce the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes
- To introduce the implementation of packages and interfaces
- To introduce the concepts of exception handling and multithreading.
- To introduce the design of Graphical User Interface using applets and swing controls.

Course Outcomes:

- Able to solve real world problems using OOP techniques.
- Able to understand the use of abstract classes.
- Able to solve problems using java collection framework and I/o classes.
- Able to develop multithreaded applications with synchronization.
- Able to develop applets for web applications.
- Able to design GUI based applications

UNIT - I

Object-Oriented Thinking- A way of viewing world – Agents and Communities, messages and methods, Responsibilities, Classes and Instances, Class Hierarchies- Inheritance, Method binding, Overriding and Exceptions, Summary of Object-Oriented concepts. Java buzzwords, An Overview of Java, Data types, Variables and Arrays, operators, expressions, control statements, Introducing classes, Methods and Classes, String handling.

Inheritance– Inheritance concept, Inheritance basics, Member access, Constructors, Creating Multilevel hierarchy, super uses, using final with inheritance, Polymorphism-ad hoc polymorphism, pure polymorphism, method overriding, abstract classes, Object class, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance.

UNIT - II

Packages- Defining a Package, CLASSPATH, Access protection, importing packages.

Interfaces- defining an interface, implementing interfaces, Nested interfaces, applying

interfaces, variables in interfaces and extending interfaces.

Stream based I/O (java.io) – The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and writing Files, Random access file operations, The Console class, Serialization, Enumerations, auto boxing, generics.

UNIT - III

Exception handling - Fundamentals of exception handling, Exception types, Termination or resumptive models, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built- in exceptions, creating own exception sub classes.

Multithreading- Differences between thread-based multitasking and process-based multitasking, Java thread model, creating threads, thread priorities, synchronizing threads, inter thread communication.

UNIT - IV

The Collections Framework (java.util)- Collections overview, Collection Interfaces, The Collection classes- Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array Deque. Accessing a Collection via an Iterator, Using an Iterator, The For-Each alternative, Map Interfaces and Classes, Comparators, Collection algorithms, Arrays, The Legacy Classes and Interfaces- Dictionary, Hashtable, Properties, Stack, Vector More Utility classes, String Tokenizer, Bit Set, Date, Calendar, Random, Formatter, Scanner

UNIT - V

GUI Programming with Swing – Introduction, limitations of AWT, MVC architecture, components, containers. Understanding Layout Managers, Flow Layout, Border Layout, Grid Layout, Card Layout, Grid Bag Layout.

Event Handling- The Delegation event model- Events, Event sources, Event Listeners, Event classes, Handling mouse and keyboard events, Adapter classes, Inner classes, Anonymous Inner classes.

A Simple Swing Application, Applets – Applets and HTML, Security Issues, Applets and Applications, passing parameters to applets. Creating a Swing Applet, Painting in Swing, A Paint example, Exploring Swing Controls- JLabel and Image Icon, JText Field, **The Swing Buttons**- JButton, JToggle Button, JCheck Box, JRadio Button, JTabbed Pane, JScroll Pane, JList, JCombo Box, Swing Menus, Dialogs.

TEXT BOOKS:

1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd.
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.

REFERENCE BOOKS:

1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
3. Object Oriented Programming through Java, P. Radha Krishna, University Press.

4. Programming in Java, S. Malhotra, S. Chudhary, 2nd edition, Oxford Univ. Press.

5. Java Programming and Object-oriented Application Development, R. A. Johnson, Cengage Learning.

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B.TECH III Year I Sem. **L T P C**

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CS604PC: MACHINE LEARNING LAB

(Common to CSE/CSD)

Course Objective: The objective of this lab is to get an overview of the various machine learning techniques and can able to demonstrate them using python.

Course Outcomes: After the completion of the course the student can able to:

* understand complexity of Machine Learning algorithms and their limitations;
* understand modern notions in data analysis-oriented computing;
* be capable of confidently applying common Machine Learning algorithms in practice and implementing their own;
* Be capable of performing experiments in Machine Learning using real-world data.

List of Experiments

1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is theprobability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result. (Ans: 15%)

2. Extract the data from database using python

3. Implement k-nearest neighbours classification using python

4. Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of k-means clustering with 3 means (i.e., 3 centroids)

VAR1	VAR2	CLASS
1.713	1.586	0
0.180	1.786	1
0.353	1.240	1
0.940	1.566	0
1.486	0.759	1
1.266	1.106	0
1.540	0.419	1
0.459	1.799	1
0.773	0.186	1

The following training examples map descriptions of individuals onto high, medium and low credit-worthiness.

medium   skiing design single   twenties no -> highRisk

high golf trading married forties yes -> lowRisk

low speedway transport married thirties yes -> medRisk

medium football banking single thirties yes -> lowRisk

high flying media married fifties yes -> highRisk

low football security single twenties no -> medRisk

medium golf media single thirties yes -> medRisk

medium golf transport married forties yes -> lowRisk

high skiing banking single thirties yes -> highRisk

 low golf unemployed married forties yes -> highRisk

Input attributes are (from left to right) income, recreation, job, status, age-group, home-owner. Find the unconditional probability of `golf' and the conditional probability of `single' given `medRisk' in the dataset?

1.   Implement linear regression using python.

2.   Implement Naïve Bayes theorem to classify the English text

3.   Implement an algorithm to demonstrate the significance of genetic algorithm

4.   Implement the finite words classification system using Back-propagation algorithm

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DS605PC: BIG DATA ANALYTICS LAB

Course Objectives:

1. The purpose of this course is to provide the students with the knowledge of Big data Analytics principles and techniques.

2. This course is also designed to give an exposure of the frontiers of Big data Analytics

Course Outcomes:

1. Use Excel as an Analytical tool and visualization tool.

2. Ability to program using HADOOP and Map reduce.

3. Ability to perform data analytics using ML in R.

4. Use cassandra to perform social media analytics.

List of Experiments:

1. Implement a simple map-reduce job that builds an inverted index on the set of input documents (Hadoop)

2. Process big data in HBase

3. Store and retrieve data in Pig

4. Perform Social media analysis using cassandra

5. Buyer event analytics using Cassandra on suitable product sales data.

6. Using Power Pivot (Excel) Perform the following on any dataset

    •   Big Data Analytics

    •   Big Data Charting

7. Use R-Project to carry out statistical analysis of big data

8. Use R-Project for data visualization of social media data

TEXT BOOKS:

1. Big Data Analytics, Seema Acharya, Subhashini Chellappan, Wiley 2015.

2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiely CIO Series, 2013.

3. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O□Reilly Media, 2012.

4. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

REFERENCE BOOKS:

1. Big Data and Business Analytics, Jay Liebowitz, Auerbach Publications, CRC press (2013).

2. Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop, Tom Plunkett, Mark Hornick, McGraw-Hill/Osborne Media (2013), Oracle press.

3. Professional Hadoop Solutions, Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, Wiley, ISBN: 9788126551071, 2015.

4. Understanding Big data, Chris Eaton, Dirk deroos et al., McGraw Hill, 2012.

5. Intelligent Data Analysis, Michael Berthold, David J. Hand, Springer, 2007.

6. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Bill Franks, 1st Edition, Wiley and SAS Business Series, 2012.

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EN606HS: ADVANCED COMMUNICATIONS SKILLS LAB

INTRODUCTION:

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

OBJECTIVES:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

SYLLABUS:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts,

guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.

3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing*/*Resume writing*/ *e-correspondence*/*Technical report writing*/ – planning for writing – improving one's writing.

4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/**PPTs** and written presentations through posters/projects/reports/   e- mails/ assignments etc.

5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

MINIMUM REQUIREMENT:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

* Spacious room with appropriate acoustics.
* Round Tables with movable chairs
* Audio-visual aids
* LCD Projector
* Public Address system
* P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
* T. V, a digital stereo & Camcorder
* Headphones of High quality

SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and used.

* Oxford Advanced Learner's Compass, 7th Edition
* DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
* Lingua TOEFL CBT Insider, by Dream tech
* TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

TEXT BOOKS:

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2nd Edition

2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

REFERENCE BOOKS:

1.   Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007

2.   Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.

3.   Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.

4.   Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.

5.   English Vocabulary in Use series, Cambridge University Press 2008.

6.   Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.

7.   Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.

8.   Job Hunting by Colm Downes, Cambridge University Press 2008.

9.   English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.

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SD609PC: INDUSTRY ORIENTED MINI PROJECT / INTERNSHIP/
SKILL DEVELOPMENT COURSE -VI (UI DESIGN -FLUTTER)

Course Objectives:

1. Learntosetupa newMaterialAppusingAndroidStudio.
2. Understandthe Widgettreeandlearnto usepre-madeFlutterWidgetsforuser interfacedesign

Course Outcomes:

1. LearntoincorporateImage andTextWidgetstocreatesimpleuserinterfaces.
2. Learntocustomizepre-builtFlutter widgets.
3. AddAppIconsforAndroidbuilds.
4. LearntorunFlutterappsonAndroidEmulatorandAndroiddevices.
5. AnintroductiontotheWidgetbuild()method.
6. Learntouselayout widgetssuchasColumns, Rows,ContainersandCards.

Syllabus:

1. UseHotReload andHotRestartto quicklyrefreshtheapp UI.
2. UsethePubspec.yamlfileto incorporate dependencies,customassetsandfonts.
3. IncorporatingMaterialiconsusingthe Iconsclass.
4. Understandhowcallbackscanbeuseddetectuser interactioninbuttonwidgets
5. DeclarativestyleofUIprogrammingand how Flutterwidgets reactto statechanges.
6. Importdartlibrariestoincorporateadditionalfunctionality.
7. Workwith variables,datatypesandfunctionsin Dart.
8. BuildflexiblelayoutsusingtheFlutterExpandedwidget.
9. UsetheDartpackagemanagertoincorporateFluttercompatiblepackages intoyourprojects
10. Workwithrefactor widgets andunderstandFlutter'sphilosophyofUIas code
11. UseDartConstructorstocreatecustomisableFlutter widgets.
12. AddingGoogleMapsto aFlutterapp .
13. Location-AwareAppsUsingGPS andGoogleMaps .
14. PublishingFlutterApps

TEXT BOOKS:

1. Marco L.Napoli,**BeginningFlutter-**AHandsonGuidetoAppDevelopment,Wiley,2019.
2. BarryBurd,FlutterFor Dummies, Wiley,2020.

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*MC609: CONSTITUTION OF INDIA

The Constitution of India is the supreme law of India. Parliament of India cannot make any lawwhich violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" – a modern and progressive concept historically developed by the thinkers of "liberalism" – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historicrevolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countriesincluding United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be "static" andtherefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the samethrough progressive interpretations of the text of the Constitution. The judicial activism of the SupremeCourt of India and its historic contributions has been recognized throughout the world and it gradually made it "as one of the strongest court in the world".

Course content

1. Meaning of the constitution law and constitutionalism

2. Historical perspective of the Constitution of India

3. Salient features and characteristics of the Constitution of India

4. Scheme of the fundamental rights

5. The scheme of the Fundamental Duties and its legal status

6. The Directive Principles of State Policy – Its importance and implementation

7. Federal structure and distribution of legislative and financial powers between the Union and the States

8. Parliamentary Form of Government in India – The constitution powers and status of the President of India

9. Amendment of the Constitutional Powers and Procedure

10. The historical perspectives of the constitutional amendments in India

11. Emergency Provisions: National Emergency, President Rule, Financial Emergency

12. Local Self Government – Constitutional Scheme in India

13. Scheme of the Fundamental Right to Equality

14. Scheme of the Fundamental Right to certain Freedom under Article 19

15. Scope of the Right to Life and Personal Liberty under Article 21

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*MC610: CYBER SECURITY

UNIT–I

Introduction to Cybercrime: Introduction, Cyber crime and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime andthe Indian ITA2000, AGlobalPerspective onCybercrimes.

UNIT-II

Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector,CloudComputing.

UNIT-III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges PosedbyMobileDevices,RegistrySettingsforMobileDevices,AuthenticationserviceSecurity,At-   tacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational SecurityPolicies an Measures in Mobile Computing Era, Laptops.

UNIT–IV

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, PasswordCracking,Key loggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoSand DDoSattacks, SQLInjection,Buffer Overflow.

UNIT-V

Cyber Security: Organizational Implications, Introduction, Cost of Cybercrimes and IPR issues, Web threatsfor Organizations, Security and Privacy Implications, Social media marketing: Security Risksand Perils for Organizations, SocialComputing and theassociated challengesfor Organizations.

TEXTBOOK:

1.   Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspec- tives,Nina-Godbole and Sunil Belapure, Wiley INDIA.

REFERENCEBOOKS:

1.   CyberSecurityEssentials,JamesGraham,RichardHowardandRyanOtson,CRCPress.
2.   IntroductiontoCyberSecurity,Chwan-Hwa(john)Wu,J. David Irwin.CRCPressT&F Group.

IV YEAR
I SEMESTER
SYLLABUS

IVYEAR **I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1.	DS701PC	Predictive Analytics	3	0	0	3
2.	DS702PC	Web and Social Media Analytics	3	0	0	3
3.		Professional Elective-III	3	0	0	3
4.		Professional Elective-IV	3	0	0	3
5.		Open Elective-II / MOOCs	3	0	0	3
6.	DS703PC	Predictive Analytics Lab	0	0	3	1.5
7.	DS704PC	Web and Social Media Analytics Lab	0	0	3	1.5
8.	DS706PROJ	Project Stage –I	0	0	6	3
		Total Credits	**15**	**0**	**12**	**21**

IV YEAR **II SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Professional Elective-V	3	0	0	3
2.		Professional Elective-VI	3	0	0	3
3.		Open Elective-III / MOOCs	3	0	0	3
4	DS801PROJ	Seminar	0	0	2	1
5.	DS802PROJ	Project Stage –II	0	0	18	9
		Total Credits	**9**	**0**	**20**	**19**

Professional Elective – III

S. No	Course Code	Course Title	L	T	P	C
1	DS731PE	Data warehouse and Business Intelligence	3	0	0	3
2	DS732PE	Video Analytics	3	0	0	3
3	CS743PE/DS733PE	Software Testing Methodologies	3	0	0	3
4	DS734PE	Advanced Text and Multimedia Analytics	3	0	0	3

Professional Elective – IV

S. No	Course Code	Course Title	L	T	P	C
1	DS741PE	Spatial and Multimedia Databases	3	0	0	3
2	AI743PE/DS742PE	Speech Recognition	3	0	0	3
3	IT733PE/DS743PE	Software Project Management	3	0	0	3
4	DS744PE	Time Series Analysis	3	0	0	3

Professional Elective – V

S. No	Course Code	Course Title	L	T	P	C
1	DS851PE	Data Stream Mining	3	0	0	3
2	DS852PE	Cryptography and Network Security	3	0	0	3
3	DS853PE/CY854PE	DevOps	3	0	0	3
4	DS854PE	Mining Massive Datasets	3	0	0	3

Professional Elective – VI

S. No	Course Code	Course Title	L	T	P	C
1	DS861PE	Principles of Entrepreneurship	3	0	0	3
2	DS862PE	Internet Of Things	3	0	0	3
3	DS863PE	Blockchain Technology	3	0	0	3
4	CS851PE/AI864PE/ DS864PE	Deep Learning	3	0	0	3

Open Elective – II

S. No	Course Code	Course Title	L	T	P	C
1	DS711OE	Database Management Systems	3	0	0	3
2	DS712OE	Data Analytics	3	0	0	3
3	DS713OE	Software Engineering	3	0	0	3
4	DS714OE	R programming	3	0	0	3

Open Elective – III						
S. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	DS811OE	Data Visualization Techniques	3	0	0	3
2	DS812OE	Scripting Languages	3	0	0	3
3	DS813OE	Computer Networks	3	0	0	3
4	DS814OE	Python Programming	3	0	0	3

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B.TECH IV Year I Sem. **L T P C**

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DS701PC: PREDICTIVE ANALYTICS

Course Objectives: The course serves to advance and refine expertise on theories, approaches and techniques related to prediction and forecasting.

Course Outcomes

1. Understand prediction-related principles, theories and approaches.
2. Learn model assessment and validation.
3. Understand the basics of predictive techniques and statistical approaches.
4. Analyze supervised and unsupervised algorithms.

UNIT - I

Linear Methods for Regression and Classification: Overview of supervised learning, Linear regression models and least squares, Multiple regression, Multiple outputs, Subset selection, Ridge regression, Lasso regression, Linear Discriminant Analysis, Logistic regression, Perceptron learning algorithm.

UNIT - II

Model Assessment and Selection: Bias, Variance, and model complexity, Bias-variance trade off, Optimism of the training error rate, Estimate of In-sample prediction error, Effective number of parameters, Bayesian approach and BIC, Cross- validation, Boot strap methods, conditional or expected test error.

UNIT - III

Additive Models, Trees, and Boosting: Generalized additive models, Regression and classification trees, Boosting methods-exponential loss and AdaBoost, Numerical Optimization via gradient boosting, Examples (Spam data, California housing, New Zealand fish, Demographic data).

UNIT - IV

Neural Networks (NN), Support Vector Machines (SVM), and K-nearest Neighbor: Fitting neural networks, Back propagation, Issues in training NN, SVM for classification, Reproducing Kernels, SVM for regression, K-nearest – Neighbour classifiers (Image Scene Classification).

UNIT - V

Unsupervised Learning and Random forests: Association rules, Cluster analysis, Principal Components, Random forests and analysis.

TEXT BOOK:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning-Data Mining, Inference, and Prediction, Second Edition, Springer Verlag, 2009.

REFERENCE BOOKS:

1.   C.M.Bishop –Pattern Recognition and Machine Learning, Springer, 2006.

2.   L. Wasserman-All of statistics.

3.   Gareth James. Daniela Witten. Trevor Hastie Robert Tibshirani. An Introduction to Statistical Learning with Applications in R.

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3 0 0 3

DS702PC: WEB AND SOCIAL MEDIA ANALYTICS

Course Objectives: Exposure to various web and social media analytic techniques.

Course Outcomes:

1. Knowledge on decision support systems.
2. Apply natural language processing concepts on text analytics.
3. Understand sentiment analysis.
4. Knowledge on search engine optimization and web analytics.

UNIT - I

An Overview of Business Intelligence, Analytics, and Decision Support: Analytics to Manage a Vaccine Supply Chain Effectively and Safely, Changing Business Environments and Computerized Decision Support, Information Systems Support for Decision Making, The Concept of Decision Support Systems (DSS), Business Analytics Overview, Brief Introduction to Big Data Analytics.

UNIT - II

Text Analytics and Text Mining: Machine Versus Men on Jeopardy!: The Story of Watson, Text Analytics and Text Mining Concepts and Definitions, Natural Language Processing, Text Mining Applications, Text Mining Process, Text Mining Tools.

UNIT - III

Sentiment Analysis: Sentiment Analysis Overview, Sentiment Analysis Applications, Sentiment Analysis Process, Sentiment Analysis and Speech Analytics.

UNIT - IV

Web Analytics, Web Mining: Security First Insurance Deepens Connection with Policyholders, Web Mining Overview, Web Content and Web Structure Mining, Search Engines, Search Engine Optimization, Web Usage Mining (Web Analytics), Web Analytics Maturity Model and Web Analytics Tools.

UNIT - V

Social Analytics and Social Network Analysis: Social Analytics and Social Network Analysis, Social Media Definitions and Concepts, Social Media Analytics.

Prescriptive Analytics - Optimization and Multi-Criteria Systems: Multiple Goals, Sensitivity Analysis, What-If Analysis, and Goal Seeking.

TEXT BOOK:

1. Ramesh Sharda, Dursun Delen, Efraim Turban, BUSINESS INTELLIGENCE AND ANALYTICS:

SYSTEMS FOR DECISION SUPPORT, Pearson Education.

REFERENCE BOOKS:

1.   Rajiv Sabherwal, Irma Becerra-Fernandez," Business Intelligence – Practice, Technologies and Management", John Wiley 2011.

2.   Lariss T. Moss, ShakuAtre, "Business Intelligence Roadmap", Addison-Wesley It Service.

3.   Yuli Vasiliev, "Oracle Business Intelligence: The Condensed Guide to Analysis and Reporting", SPD Shroff, 2012.

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DS731PE: DATA WAREHOUSE AND BUSINESS INTELLIGENCE
(Professional Elective-III)

Course Objectives:

1. This course is concerned with extracting data from the information systems that deal with the day-to-day operations and transforming it into data that can be used by businesses to drive high-level decision making

2. Students will learn how to design and create a data warehouse, and how to utilize the process of extracting, transforming, and loading (ETL) data into data warehouses.

Course Outcomes:

1. Understand architecture of data warehouse and OLAP operations.

2. Understand Fundamental concepts of BI and Analytics

3. Application of BI Key Performance indicators

4. Design of Dashboards, Implementation of Web Analytics

5. Understand Utilization of Advanced BI Tools and their Implementation.

6. Implementation of BI Techniques and BI Ethics.

UNIT - I

DATA WAREHOUSE: Data Warehouse-Data Warehouse Architecture- Multidimensional Data Model- Data cube and OLAP Technology-Data Warehouse Implementation -DBMS schemas for Decision support - Efficient methods for Data cube computation.

UNIT - II

Business Intelligence: Introduction – Definition, Leveraging Data and Knowledge for BI, BI Components, BI Dimensions, Information Hierarchy, Business Intelligence and Business Analytics. BI Life Cycle. Data for BI - Data Issues and Data Quality for BI.

UNIT - III

BI Implementation - Key Drivers, Key Performance Indicators and Performance Metrics, BI Architecture/Framework, Best Practices, Business Decision Making, Styles of BI-vent-Driven alerts - A cyclic process of Intelligence Creation. The value of Business Intelligence-Value driven & Information use.

UNIT - IV

Advanced BI – Big Data and BI, Social Networks, Mobile BI, emerging trends, Description of different BI-Tools (Pentaho, KNIME)

UNIT - V

Business intelligence implementation-Business Intelligence and integration implementation-connecting in BI systems- Issues of legality- Privacy and ethics- Social networking and BI.

TEXT BOOKS:

1. Data Mining – Concepts and Techniques - JIAWEI HAN & MICHELINE KAMBER, Elsevier.
2. Rajiv Sabherwal "Business Intelligence" Wiley Publications, 2012.

REFERENCE BOOKS:

1. Efraim Turban, Ramesh Sharda, Jay Aronson, David King, Decision Support and Business Intelligence Systems, 9th Edition, Pearson Education, 2009.

2. David Loshin, Business Intelligence - The Savy Manager's Guide Getting Onboard with Emerging IT, Morgan Kaufmann Publishers, 2009.

3. Philo Janus, Stacia Misner, Building Integrated Business Intelligence Solutions with SQL Server, 2008 R2 & Office 2010, TMH, 2011.

4. Business Intelligence Data Mining and Optimization for decision making [Author: Carlo-Verellis] [Publication: (Wiley)].

5. Data Warehousing, Data Mining & OLAP- Alex Berson and Stephen J. Smith- Tata McGraw- Hill Edition, Tenth reprint 2007.

6. Building the Data Warehouse- W. H. Inmon, Wiley Dreamtech India Pvt. Ltd.

7. Data Mining Introductory and Advanced topics –MARGARET H DUNHAM, PEA.

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DS732PE: VIDEO ANALYTICS
(Professional Elective-III)

Course Objectives: To acquire the knowledge of extracting information from surveillance videos, understand the models used for recognition of objects, humans in videos and perform gait analysis.

Course Outcomes:

1. Understand the basics of video- signals and systems.
2. Able to estimate motion in a video.
3. Able to detect the objects and track them.
4. Recognize activity and analyze behaviour.
5. Evaluate face recognition technologies.

UNIT - I

INTRODUCTION Multidimensional signals and systems: signals, transforms, systems, sampling theorem. Digital Images and Video: human visual system and color, digital video, 3D video, digital-video applications, image and video quality.

UNIT - II

MOTION ESTIMATION Image formation, motion models, 2D apparent motion estimation, differential methods, matching methods, non-linear optimization methods, transform domain methods, 3D motion and structure estimation.

UNIT - III

VIDEO ANALYTICS Introduction- Video Basics - Fundamentals for Video Surveillance- Scene Artifacts- Object Detection and Tracking: Adaptive Background Modelling and Subtraction- Pedestrian Detection and Tracking Vehicle Detection and Tracking- Articulated Human Motion Tracking in Low-Dimensional Latent Spaces.

UNIT - IV

BEHAVIORAL ANALYSIS & ACTIVITY RECOGNITION Event Modelling- Behavioral Analysis- Human Activity Recognition-Complex Activity Recognition Activity modelling using 3D shape, Video summarization, shape-based activity models- Suspicious Activity Detection.

UNIT - V

HUMAN FACE RECOGNITION & GAIT ANALYSIS Introduction: Overview of Recognition algorithms – Human Recognition using Face: Face Recognition from still images, Face Recognition from video, Evaluation of Face Recognition Technologies- Human Recognition using gait: HMM Framework for

Gait Recognition, View Invariant Gait Recognition, Role of Shape and Dynamics in Gait Recognition.

TEXT BOOKS:

1. Murat Tekalp, "Digital Video Processing", second edition, Pearson, 2015

2. Rama Chellappa, Amit K. Roy-Chowdhury, Kevin Zhou. S, "Recognition of Humans and their Activities using Video", Morgan & Claypool Publishers, 2005.

3. Yunqian Ma, Gang Qian, "Intelligent Video Surveillance: Systems and Technology", CRC Press (Taylor and Francis Group), 2009.

REFERENCE BOOKS:

1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer, 2011.

2. Yao Wang, JornOstermann and Ya-Qin Zhang, "Video Processing and Communications", Prentice Hall, 2001.

3. Thierry Bouwmans, FatihPorikli, Benjamin Höferlin and Antoine Vacavant, "Background Modeling and Foreground Detection for Video Surveillance: Traditional and Recent Approaches, Implementations, Benchmarking and Evaluation", CRC Press, Taylor and Francis Group, 2014.

4. Md. Atiqur Rahman Ahad, "Computer Vision and Action Recognition-A Guide for Image Processing and Computer Vision Community for Action Understanding", Atlantis Press, 2011.

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B.TECH IV Year I Sem.   **L T P C**

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CS743PE/DS733PE: SOFTWARE TESTING METHODOLOGIES
(Professional Elective-III)
(Common to CSE/CSD)

Prerequisites: A course on "Software Engineering".

Course Objectives

- To provide knowledge of the concepts in software testing such as testing process, criteria, strategies, and methodologies.
- To develop skills in software test automation and management using latest tools.

Course Outcomes: Design and develop the best test strategies in accordance to the development model.

UNIT - I

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs.

Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT - II

Transaction Flow Testing: transaction flows, transaction flow testing techniques. Dataflow testing: Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing. Domain Testing: domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT - III

Paths, Path products and Regular expressions: path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.

Logic Based Testing: overview, decision tables, path expressions, kv charts, specifications.

UNIT - IV

State, State Graphs and Transition testing: state graphs, good & bad state graphs, state testing, Testability tips.

UNIT - V

Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like JMeter

or Win-runner).

TEXT BOOKS:

1.   Software Testing techniques - Baris Beizer, Dreamtech, second edition.
2.   Software Testing Tools – Dr. K. V. K. K. Prasad, Dreamtech.

REFERENCE BOOKS:

1.   The craft of software testing - Brian Marick, Pearson Education.
2.   Software Testing Techniques – SPD(Oreille)
3.   Software Testing in the Real World – Edward Kit, Pearson.
4.   Effective methods of Software Testing, Perry, John Wiley.
5.   Art of Software Testing – Meyers, John Wiley.

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DS734PE: ADVANCED TEXT AND MULTIMEDIA ANALYTICS
(Professional Elective-III)

Course Objective:

- To provide an overview of common text mining and social media data analytic activities.
- To understand the complexities of processing text and network data from different data sources.
- To enable students to solve complex real-world problems for sentiment analysis and Recommendation systems.

Course Outcomes:

- Interpret the terminologies, metaphors and perspectives of social media analytics.
- Apply a wide range of classification, clustering, estimation and prediction algorithms on Textual data.
- Perform social network analysis to identify important social actors, subgroups and network properties in social media sites.
- Apply state of the art web mining tools and libraries on realistic data sets as a basis for business decisions and applications.
- Provide solutions to the emerging problems with social media such as behavior analytics and recommendation systems.
- Design new solutions to opinion extraction, sentiment classification and data summarization problems.

UNIT - I

Introduction to Text Mining: Text Representation- tokenization, stemming, stop words, TF-IDF, Feature Vector Representation, NER, N-gram modeling.

UNIT - II

Mining Textual Data: Text Clustering, Text Classification, Topic Modeling-LDA,HDP

Introduction to Web-Mining: Inverted indices and Boolean queries. PLSI, Query optimization, page ranking.

UNIT - III

Web Usage Web content Mining: Web Crawling-Crawler Algorithms, Implementation Issues, Evaluation, Session & visitor Analysis, Visitor Segmentation, Analysis of Sequential & Navigational Patterns, Predictions based on web user transactions.

UNIT - IV

Introduction to Social Media Network: Essentials of Social graphs, Social Networks, Models, Information Diffusion in Social Media.

UNIT - V

Mining Social Media: Behavioral Analytics, Influence and Homophily, Recommendation in Social Media

Sentimental Mining:

Sentiment classification feature based opinion mining, comparative sentence and relational mining, Opinion spam. Recent Threads.

TEXT BOOKS:

1. Bing Liu, "Web Data Mining-Exploring Hyperlinks, Contents, and Usage Data", Springer, Second Edition, 2011.
2. Reza Zafarani, Mohammad Ali Abbasi and Huan Liu, "Social Media Mining - An Introduction", Cambridge University Press, 2014.

REFERENCE BOOKS:

1. Bing Liu, "Sentiment Analysis and Opinion Mining", Morgan & Claypool Publishers, 2012.
2. Nitin Indurkhya, Fred J Damerau, "Handbook of Natural Language Process", 2nd Edition, CRC Press, 2010.
3. Matthew A.Russell, "Mining the social web", 2nd edition- O'Reilly Media, 2013.

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B.TECH IV Year I Sem.   **L T P C**

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DS741PE: SPATIAL AND MULTIMEDIA DATABASES
(Professional Elective-IV)

Course Objective: Introduce the basic concepts, data models and indexing structures for spatial data, multimedia data.

Course Outcomes:

1. Understand data models, storage, indexing and design of spatial databases.
2. Represent image database with R-tree.
3. Store and retrieve multimedia data.

UNIT - I

Introduction to Spatial Databases: Overview, beneficiaries, GIA and SDBMS, users, Space taxonomy, query language, query processing, query optimization. Spatial Concepts and Data Models: Models of Spatial information, three step database design, Extending the ER model with spatial concept, object- oriented data modeling. Spatial Query Languages.

UNIT - II

Spatial Storage and Indexing: Storage-disks and files, spatial indexing, TR*, spatial join index. Query processing and optimization – Evaluation of Spatial operations, query optimization, Analysis of Spatial index structures, distributed and parallel spatial database system. Multidimensional Data Structures: k- d Trees, Point Quadtrees, The MX-Quadtree, R-Trees, comparison of Different Data Structures.

9UNIT - III

Image Databases: Raw Images, Compressed Image Representations, Image Processing: Segmentation, Similarity-Based Retrieval, Alternative Image DB Paradigms, Representing Image DBs with Relations, Representing Image DBs with R-Trees, Retrieving Images By Spatial Layout, Implementations. Text/Document Databases: Precision and Recall, Stop Lists, Word Stems, and Frequency Tables, Latent Semantic Indexing, TV-Trees, Other Retrieval Techniques.

UNIT - IV

Video Databases : Organizing Content of a Single Video, Querying Content of Video Libraries, Video Segmentation, video Standards Audio Databases : A General Model of Audio Data, Capturing Audio Content through Discrete Transformation, Indexing Audio Data Multimedia Databases : Design and Architecture of a Multimedia Database, Organizing Multimedia Data Based on The Principle of Uniformity, Media Abstractions, Query Languages for Retrieving Multimedia Data, Indexing SMDSs with Enhanced Inverted Indices, Query Relaxation/Expansion.

UNIT - V

Creating Distributed Multimedia Presentations: Objects in Multimedia Presentations, Specifying Multimedia Documents with Temporal Constraints, Efficient Solution of Temporal Presentation Constraints, Spatial Constraints. Distributed Media Servers: Distributed multimedia server architecture, distributed retrieval plans, optimal distributed retrieval plans.

TEXT BOOKS:

1. Shashi Shekhar, Sanjiv Chawla, Spatial Databases-A Tour, Pearson Education.
2. V.S. Subrahmanian, Principles of Multimedia Database Systems, Morgan Kauffman.

REFERENCE BOOK:

1. Multimedia Databases: An object relational approach, Lynne Dunckley, Pearson Education.
2. Multimedia Database Systems, Prabhakaran, Springer.

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B.TECH IV Year I Sem.   **L T P C**

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AI743PE/DS742PE: SPEECH RECOGNITION

(Professional Elective-IV)

(Common to CSD/CSM)

Objectives: The student should be made:

- To understand the speech production mechanism and the various speech analysis tech- niques and speech models
- To understand the speech compression techniques
- To understand the speech recognition techniques
- To know the speaker recognition and text to speech synthesis techniques

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

- Design speech compression techniques
- Configure speech recognition techniques
- Design speaker recognition systems
- Design text to speech synthesis systems

UNIT I

- SPEECH SIGNAL CHARACTERISTICS & ANALYSIS

Speech production process - speech sounds and features- - Phonetic Representation of Speech

-- representing= speech in time and frequency domains - Short-Time Analysis of Speech - Short- Time Energy and Zero-Crossing Rate - Short-Time Autocorrelation Function - Short-Time Fou- rier Transform (STFT) - Speech Spectrum - Cepstrum - Mel-Frequency Cepstrum Coefficients

- Hearing and Auditory Perception - Perception of Loudness - Critical Bands - Pitch Perception

UNIT II

SPEECH COMPRESSION

Sampling and Quantization of Speech (PCM) - Adaptive differential PCM - Delta Modulation - Vector Quantization- Linear predictive coding (LPC) - Code excited Linear predictive Coding (CELP)

UNIT III

SPEECH RECOGNITION

LPC for speech recognition- Hidden Markov Model (HMM)- training procedure for HMM- sub- word unit model based on HMM- language models for large vocabulary speech recognition

- Overall recognition system based on subword units - Context dependent subword units- Se- mantic post processor for speech recognition

UNIT IV

SPEAKER RECOGNITION

Acoustic parameters for speaker verification- Feature space for speaker recognition-similarity measures- Text dependent speaker verification-Text independent speaker verification techniques

UNIT V

SPEAKER RECOGNITION AND TEXT TO SPEECH SYNTHESIS

Text to speech synthesis (TTS)-Concatenative and waveform synthesis methods, sub-word units for TTS, intelligibility and naturalness-role of prosody

TEXT BOOKS:

1. L. R. Rabiner and R. W. Schafer, Introduction to Digital Signal Processing, Foundations and Trendsin Signal Processing Vol. 1, Nos. 1–2 (2007) 1–194

2. Ben Gold and Nelson Morgan ―Speech and Audio signal processing- processing and perception of speech and music‖, John Wiley and sons 2006

REFERENCES

1. Lawrence Rabiner, Biiing and– Hwang Juang and B.Yegnanarayana ―Fundamentals of Speech Recognition‖, Pearson Education, 2009

2. Claudio Becchetti and Lucio Prina Ricotti, ―Speech Recognition‖, John Wiley and Sons, 1999

3. Donglos O shanhnessy ―Speech Communication: Human and Machine ―, 2nd Ed. Uni- versity press 2001.

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B.TECH IV Year I Sem. **L T P C**

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IT733PE/DS743PE: SOFTWARE PROJECT MANAGEMENT
(Professional Elective-IV)
(Common to CSD/IT)

Prerequisites: A course on "Software Engineering".

Course Objectives

1. To develop skills in software project management
2. The topics include-software economics; software development life cycle; artifacts of the process; workflows; checkpoints; project organization and responsibilities; project control and process instrumentation.

Course Outcomes

1. Gain knowledge of software economics, phases in the life cycle of software development, project organization, project control and process instrumentation.
2. Analyze the major and minor milestones, artifacts and metrics from management and technical perspective.
3. Design and develop software product using conventional and modern principles of software project management

UNIT - I

Conventional Software Management: The waterfall model, conventional software Management performance. **Evolution of Software Economics:** Software economics, pragmatic software cost estimation.

UNIT - II

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections. **The old way and the new:** The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

UNIT - III

Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases. **Artifacts of the process:** The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts. **Model based software architectures:** A Management perspective and technical perspective. **Work Flows of the process:** Software process workflows, Iteration workflows.

UNIT - IV

Checkpoints of the process: Major milestones, Minor Milestones, Periodic status assessments. Iterative Process Planning: work breakdown structures, planning guidelines, cost and schedule es-

timating, Iteration planning process, Pragmatic planning. **Project Organizations and Responsi-bilities:** Line-of-Business Organizations, Project Organizations, evolution of Organizations. Process Automation**:** Automation building blocks, The Project Environment.

UNIT - V

Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation. Tailoring the Process**:** Process discriminates. **Future Software Project Management:** modern Project Pro-files, Next generation Software economics, modern process transitions. **Case Study:** The command Center Processing and Display system- Replacement (CCPDS-R).

TEXT BOOK:

1. Software Project Management, Walker Royce: Pearson Education, 2005.

REFERENCE BOOKS:

1.   Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw-Hill Edition.
2.   Software Project Management, Joel Henry, Pearson Education.
3.   Software Project Management in practice, Pankaj Jalote, Pearson Education. 2005.

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DS744PE: TIME SERIES ANALYSIS
(Professional Elective-IV)

Prerequisites: Little knowledge about mathematics and programming

Course Objectives

- The Knowledge of basic concepts in time series analysis and forecasting
- Understanding the use of time series models for forecasting and the limitations of the methods.

Course Outcomes

- Ability to criticize and judge time series regression models.
- Distinguish the ARIMA modeling of stationary and non-stationary time series
- Compare with multivariate time series and other methods of applications

UNIT1:IntroductionOfTimeseriesAnalysisIntroductiontoTimeSeriesandForecasting-Different typesof-data-InternalstructuresoftimeseriesModelsfortimeseriesanalysis-Autocorrelationand Partial autocorrelation. Examples of Time series Nature and uses of forecasting-Forecasting Process-Data for forecasting –Resources for forecasting.

UNIT2: StatisticsBackgroundForForecastingGraphicalDisplays-TimeSeriesPlots-Plotting Smoothed-Data-NumericalDescriptionofTimeSeriesData-UseofDataTransformationsandAd- justments-General-ApproachtoTimeSeriesModelingandForecasting-EvaluatingandMonitoring Forecasting Model Performance.

UNIT3: Introduction - Least Squares Estimation in Linear Regression Models - Statistical Inference in LinearRegression-PredictionofNewObservations-ModelAdequacyChecking-VariableSelection Methods in Regression - Generalized and Weighted Least Squares- Regression Models for General Time Series Data- Exponential Smoothing-First order and Second order.

UNIT4: AutoregressiveIntegratedMovingAverage(Arima)ModelsAutoregressiveMovingAv- erage(ARMA)Models-StationaryandInevitabilityofARMAModels-CheckingforStationarity using Variogram-Detecting Non-stationarity - Auto regressive Integrated Moving Average (ARIMA) Models-Forecasting using ARIMA-Seasonal Data-Seasonal ARIMA Models Forecasting using Seasonal ARIMA Models Introduction Findingthe"BEST"Model-Example:InternetUsersData-ModelSelectionCriteria-Im- pulse Response Function to Study the Differences in Models - Comparing Impulse Response Functions for Competing Models.

UNIT5: MultivariateTimeSeriesModelsAndForecastingMultivariateTimeSeriesModelsandFore- cast-ing MultivariateStationaryProcess-VectorARIMAModels-VectorAR(VAR)Models-Neural

NetworksandForecasting-SpectralAnalysis–BayesianMethodsinForecasting.

1. TEXTBOOKS

2. Introduction To Time Series Analysis And Forecasting, 2nd Edition, Wiley Series In Probability And Statistics, By Douglas C. Montgomery, Cheryl L. Jen(2015)

3. MasterTimeSeriesDataProcessing,Visualization,AndModelingUsingPythonDr.Avishek Pal Dr. Pks Prakash (2017)

4. TimeSeriesAnalysisAndForecastingByExampleSørenBisgaardMuratKulahciTechnical University-OfDenmarkCopyright©2011ByJohnWiley&Sons, Inc. All Rights Reserved.

REFERENCEBOOKS

1. Peter J. Brock well RichardA. Davis Introduction To Time Series And Forecasting Third Edi- tion. (2016).

2. Multivariate Time Series Analysis and Applications William W.S. Wei Department of Statistical Science Temple University, Philadelphia, PA, SA This edition first published 2019John Wiley & Sons Ltd

3. Time Series Analysis by James D Hamilton Copyright © 1994 by prince town university press.

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DS711OE: DATABASE MANAGEMENT SYSTEMS
(Open Elective-II)

Course Objectives:

*   To understand the basic concepts and the applications of database systems.
*   To master the basics of SQL and construct queries using SQL.
*   To understand the relational database design principles.
*   To become familiar with the basic issues of transaction processing and concurrencycontrol.
*   To become familiar with database storage structures and access techniques.

Course Outcomes:

*   Demonstrate the basic elements of a relational database management system.
*   Ability to identify the data models for relevant problems.
*   Ability to design entity relationship model and convert entity relationshipdiagrams into RDBMS and formulate SQL queries on the data.
*   Apply normalization for the development of application software.

UNIT - I

Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages – DDL, DML, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database Users and Administrators, History of Database Systems.

Introduction to Data base design: Database Design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises.

Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design: ER to Relational, Introduction to Views, Destroying /Altering Tables and Views.

UNIT - II

Relational Algebra and Calculus: Preliminaries, Relational Algebra, Relational calculus – Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.

SQL: Queries, Constraints, **Triggers:** Form of Basic SQL Query, UNION,INTERSECT, and EXCEPT, Nested Queries, Aggregate Operators, NULL values Complex Integrity Constraints in SQL, Triggers and Active Data bases, Designing Active Databases..

UNIT - III

Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Depend-

encies - Reasoning about FDs, Normal Forms, Properties of Decompositions, Normalization, Schema Refinement in Database Design, Other Kinds of Dependencies.

UNIT - IV

Transaction Management: Transactions, Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity Transaction Isolation Levels, Implementation of Isolation Levels**.**

Concurrency Control: Lock–Based Protocols, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols, Multiversion Schemes.

Recovery System-Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with loss of nonvolatile storage, Early Lock Release and Logical Undo Operations, Remote Backup systems.

UNIT - V

Storage and Indexing: Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing, Index Data Structures, Comparison of File Organizations.

Tree-Structured Indexing: Intuition for tree Indexes, Indexed Sequential Access Method(ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

Hash- Based Indexing: Static Hashing, Extendible hashing, Linear Hashing, Extendible vs.Linear Hashing.

TEXT BOOKS:

1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, McGraw Hill Education (India) Private Limited, 3rd Edition. (Part of UNIT-I, UNIT-II, UNIT-III, UNIT-V)

2. Data base System Concepts, A. Silberschatz, Henry. F. Korth, S. Sudarshan, McGraw Hill Education(India) Private Limited I, 6th edition.(Part of UNIT-I, UNIT-IV)

REFERENCE BOOKS:

1. Database Systems, 6th edition, R Elmasri, Shamkant   B.Navathe,   Pearson   Education.

2. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning.

3. Introduction to Database Management, M. L. Gillenson and others, Wiley StudentEdition.

4. Database Development and Management, Lee Chao, Auerbach publications, Taylor& Francis Group.

5. Introduction to Database Systems, C. J. Date, Pearson Education.

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DS712OE: DATA ANALYTICS
(Open Elective-II)

Prerequisites

1.   A course on "Database Management Systems".

2.   Knowledge of probability and statistics.

Course Objectives:

•   To explore the fundamental concepts of data analytics.

•   To learn the principles and methods of statistical analysis

•   Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.

•   To understand the various search methods and visualization techniques.

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

•   Understand the impact of data analytics for business decisions and strategy

•   Carry out data analysis/statistical analysis

•   To carry out standard data visualization and formal inference procedures

•   Design Data Architecture

•   Understand various Data Sources

UNIT - I

Data Management: Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality(noise, outliers, missing values, duplicate data) and Data Processing & Processing.

UNIT - II

Data Analytics: Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling.

UNIT - III

Regression – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc.

Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

UNIT - IV

Object Segmentation: Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc. Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyze for prediction

UNIT - V

Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

TEXT BOOKS:

1.   Student's Handbook for Associate Analytics – II, III

2.   Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

REFERENCE BOOKS:

1.   Introduction to Data Mining, Tan, Steinbach and Kumar, Addision Wisley, 2006.

2.   Data Mining Analysis and Concepts, M. Zaki and W. Meira

3.   Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Milliway Labs Jeffrey D Ullman Stanford Univ.

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DS713OE: SOFTWARE ENGINEERING

(Open Elective-II)

Course Objectives

- The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.
- Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams

Course Outcomes

- Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD).
- Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
- Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

UNIT - I

Introduction to Software Engineering: The evolving role of software, changing nature of software, software myths.

A Generic view of process: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI), process patterns, process assessment, personal and team process models.

Process models: The waterfall model, incremental process models, evolutionary process models, the unified process.

UNIT - II

Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.

Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

System models: Context models, behavioral models, data models, object models, structured methods.

UNIT - III

Design Engineering: Design process and design quality, design concepts, the design model. **Creating an architectural design:** software architecture, data design, architectural styles and patterns,

architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

UNIT - IV

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.

Product metrics: Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.

UNIT - V

Metrics for Process and Products: Software measurement, metrics for software quality.

Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, isk refinement, RMMM, RMMM plan.

Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

TEXT BOOKS:

1.   Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, Mc Graw Hill International Edition.
2.   Software Engineering- Sommerville, 7th edition, Pearson Education.
3.   The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.

REFERENCE BOOKS:

1.   Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
2.   Software Engineering principles and practice- Waman S Jawadekar, The Mc Graw-Hill Companies.
3.   Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.

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B.TECH IV Year I Sem.   **L T P C**

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DS714OE: R PROGRAMMING
(Open Elective-II)

Course Objectives:

- Understanding and being able to use basic programming concepts
- Automate data analysis
- Working collaboratively and openly on code
- Knowing how to generate dynamic documents
- Being able to use a continuous test-driven development approach

Course Outcomes:

- be able to use and program in the programming language R
- be able to use R to solve statistical problems
- be able to implement and describe Monte Carlo the technology
- be able to minimize and maximize functions using R

UNIT – I

Introduction: Overview of R, R data types and objects, reading and writing data, sub setting R Objects, Essentials of the R Language, Installing R, Running R, Packages in R, Calculations, Complex numbers in R, Rounding, Arithmetic, Modulo and integer quotients, Variable names and assignment, Operators, Integers, Factors, Logical operations

UNIT – II

Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes

Vectors: Generating sequences, Vectors and subscripts, Extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations

UNIT – III

Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List Elements, Getting the Size of a List, Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists, DATA FRAMES, Creating Data Frames, Accessing Data Frames, Other Matrix-Like Operations

UNIT - IV

Factors and Tables, Factors and Levels, Common Functions Used with Factors,Working with Tables,

Matrix/Array-Like Operations on Tables , Extracting a Sub table, Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions

UNIT - V

OBJECT-ORIENTED PROGRAMMING: S Classes, S Generic Functions, Writing S Classes, Using Inheritance, S Classes, Writing S Classes, Implementing a Generic Functionon an S Class, visualization, Simulation, code profiling, Statistical Analysis with R, data manipulation

TEXT BOOKS:

1.   R Programming for Data Science by Roger D. Peng
2.   The Art of R Programming by Prashanth singh, Vivek Mourya, Cengage LearningIndia**.**

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B.TECH IV Year I Sem. **L T P C**

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DS703PC: PREDICTIVE ANALYTICS LAB

CourseObjectives: Exposuretovariouspredictiveanalytictechniques.

Course Outcomes:

1. ImplementLinearRegression models.
2. Applythe knowledgeofAddictivemodels.
3. Implementnmodel assessmentandvalidation
4. Applythe knowledgeofModelAssessment

List ofExperiments

1. WriteaPythonprogramtoimplementSimpleLinearRegression
2. ImplementlogisticRegression
3. ImplementSVM/Decisiontreeclassificationtechniques.
4. Implementclusteringtechniques
5. BasicCRUDoperationsin MongoDB.
6. ImplementNaiveBayesalgorithm.
7. WriteaProgramonTime-seriesanalysis
8. Executeclusteringandassociationruleminingalgorithmsondifferentdatasets.
9. ToperformmarketbasketanalysisusingAssociationRules (Apriori).
10. ImplementAdaBoostalgorithm.
11. Executegradientboostingalgorithm,Examples(Spamdata,Californiahousing,New Zealand fish, Demographic data).

TEXT BOOKS:

1. TrevorHastie,Robert Tibshirani,JeromeFriedman,TheElementsofStatisticalLearning-Data
2. Mining, Inference,andPrediction,SecondEdition,SpringerVerlag,2009.

REFERENCEBOOKS:

1. C.M.Bishop–PatternRecognitionandMachineLearning, Springer,2006.
2. L.Wasserman-Allofstatistics.
3. GarethJames.DanielaWitten.TrevorHastieRobertTibshirani.AnIntroductionto StatisticalLearning with Applications inR.

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B.TECH IV Year I Sem.   **L T P C**

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DS704PC: WEB AND SOCIAL MEDIA ANALYTICS LAB

Course Objectives: Exposure to various web and social media analytic techniques.

Course Outcomes:

1. Knowledge on decision support systems.

2. Apply natural language processing concepts on text analytics.

3. Understand sentiment analysis.

4. Knowledge on search engine optimization and web analytics.

List of Experiments

1. Preprocessing text document using NLTK of Python
    a. Stopword elimination
    b. Stemming
    c. Lemmatization
    d. POS tagging
    e. Lexical analysis
2. Sentiment analysis on customer review on products
3. Web analytics
    a. Web usage data (web server log data, clickstream analysis)
    b. Hyperlink data
4. Search engine optimization- implement spamdexing
5. Use Google analytics tools to implement the following
    a. Conversion Statistics
    b. Visitor Profiles
6. Use Google analytics tools to implement the Traffic Sources.

Resources:

1. Stanford core NLP package

2. GOOGLE.COM/ANALYTICS

TEXT BOOKS:

1. Ramesh Sharda, Dursun Delen, Efraim Turban, BUSINESS INTELLIGENCE AND ANALYTICS: SYSTEMS FOR DECISION SUPPORT, Pearson Education.

REFERENCE BOOKS:

1. Rajiv Sabherwal, Irma Becerra- Fernandez,” Business Intelligence – Practice, Technologies and Management”, John Wiley 2011.

2. Lariss T. Moss, Shaku Atre, “Business Intelligence Roadmap”, Addison-Wesley It Service.

3. Yuli Vasiliev, “Oracle Business Intelligence: The Condensed Guide to Analysis and Reporting”, SPD Shroff, 2012.

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DS706PROJ: PROJECT STAGE –I
(Common to CSD)

IV YEAR
II SEMESTER
SYLLABUS

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B.TECH IV Year II Sem. **L T P C**

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DS851PE: DATA STREAM MINING

(Professional Elective-V)

Prerequisites

1. A basic knowledge of "Data Mining"

Course Objectives:

1. The aim of the course is to introduce the fundamentals of Data Stream Mining.
2. The course gives an overview of – Mining Strategies, methods and algorithms for data stream mining.

Course Outcomes:

1. Understand how to formulate a knowledge extraction problem from data streams.
2. Ability to apply methods / algorithms to new data stream analysis problems.
3. Evaluate the results and understand the functioning of the methods studied.
4. Demonstrate decision tree and adaptive Hoeffding Tree concepts

UNIT - I

MOA Stream Mining, Assumptions, Requirements, Mining Strategies, Change Detection Strategies, MOA Experimental Settings, Previous Evaluation Practices, Evaluation Procedures for Data Streams, Testing Framework, Environments, Data Sources, Generation Speed and Data Size, Evolving Stream Experimental Setting.

UNIT - II

Hoeffding Trees, The Hoeffding Bound for Tree Induction, The Basic Algorithm, Memory Management, Numeric Attributes, Batch Setting Approaches, Data Stream Approaches.

UNIT - III

Prediction Strategies, Majority Class, Naïve Bayes Leaves, Adaptive Hybrid, Hoeffding Tree Ensembles, Data Stream Setting, Realistic Ensemble Sizes.

UNIT - IV

Evolving Data Streams, Algorithms for Mining with Change, A Methodology for Adaptive Stream Mining, Optimal Change Detector and Predictor, Adaptive Sliding Windows, Introduction, Maintaining Updated Windows of Varying Length.

UNIT - V

Adaptive Hoeffding Trees, Introduction, Decision Trees on Sliding Windows, Hoeffding Adaptive

Trees, Adaptive Ensemble Methods, New methods of Bagging using trees of different size, New method of bagging using ADWIN, Adaptive Hoeffding Option Trees, Method performance.

TEXT BOOK:

1. DATA STREAM MINING: A Practical Approach by Albert Bifet and Richard Kirkby.

REFERENCE BOOKS:

1.   Knowledge discovery from data streams by Gama João. ISBN: 978-1-4398-2611-9.
2.   Machine Learning for Data Streams by Albert Bifet, Ricard Gavalda; MIT Press, 2017.

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DS852PE: CRYPTOGRAPHY AND NETWORK SECURITY
(Professional Elective-V)

Course Objectives:

- Explain the objectives of information security
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.
- Understand the basic categories of threats to computers and networks
- Describe public-key cryptosystem.
- Describe the enhancements made to IPv4 by IPSec
- Understand Intrusions and intrusion detection
- Discuss the fundamental ideas of public-key cryptography.
- Generate and distribute a PGP key pair and use the PGP package to send an encrypted email message.
- Discuss Web security and Firewalls

Course Outcomes:

- Student will be able to understand basic cryptographic algorithms, message and web authentication and security issues.
- Ability to identify information system requirements for both of them such as client and server.
- Ability to understand the current legal issues towards information security

UNIT – I

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security. **Cryptography Concepts and Techniques:** Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT – II

Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4.

Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography,

Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT – III

Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512),

Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme. Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure

UNIT – IV

Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH) Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security.

UNIT – V

E-Mail Security: Pretty Good Privacy, S/MIME **IP Security:** IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange **Case Studies on Cryptography and security**: Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability

TEXT BOOKS:

1. Cryptography and Network Security – Principles and Practice: William Stallings, Pearson   Education, 6th Edition
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition

REFERENCE BOOKS:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

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DS853PE/CY854PE: DEVOPS

(Professional Elective-V)

(Common to CSC/CSD)

Course Objectives: The main objectives of this course are to

1. Describe the agile relationship between development and IT operations.
2. Understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability
3. Implement automated system update and DevOps lifecycle

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

1. Identify components of Devops environment
2. Describe Software development models and architectures of DevOps
3. Apply different project management, integration, testing and code deployment tool
4. Investigate different DevOps Software development models
5. Assess various Devops practices
6. Collaborate and adopt Devops in real-time projects

UNIT - I

Introduction: Introduction, Agile development model, DevOps, and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples

UNIT - II

Software development models and DevOps: DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing.

DevOps influence on Architecture: Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Microservices, and the data tier, DevOps, architecture, and resilience.

UNIT - III

Introduction to project management: The need for source code control, The history of source code management, Roles and code, source code management system and migrations, Shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

UNIT - IV

Integrating the system: Build systems, Jenkins build server, Managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures.

UNIT - V

Testing Tools and automation: Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development

Deployment of the system: Deployment systems, Virtualization stacks, code execution at the client, Puppet master and agents, Ansible, Deployment tools: Chef, Salt Stack and Docker

TEXT BOOKS:

1.   Joakim Verona. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018). ISBN-10: 1788392574

2.   Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952

REFERENCE BOOK:

1.   Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley; ISBN-10.

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B.TECH IV Year II Sem.   **L T P C**
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DS854PE: MINING MASSIVE DATASETS
(Professional Elective-V)

Prerequisites: Students should be familiar with Data mining, algorithms, basic probability theory and Discrete math.

Course Objectives:

1. This course will cover practical algorithms for solving key problems in mining of massive datasets.
2. This course focuses on parallel algorithmic techniques that are used for large datasets.
3. This course will cover stream processing algorithms for data streams that arrive constantly, page ranking algorithms for web search, and online advertisement systems that are studied in detail.

Course Outcomes:

1. Handle massive data using MapReduce.
2. Develop and implement algorithms for massive data sets and methodologies in the context of data mining.
3. Understand the algorithms for extracting models and information from large datasets
4. Develop recommendation systems.
5. Gain experience in matching various algorithms for particular classes of problems.

UNIT - I

Data Mining-Introduction-Definition of Data Mining-Statistical Limits on Data Mining,

MapReduce and the New Software Stack-Distributed File Systems, MapReduce, Algorithms Using MapReduce.

UNIT - II

Similarity Search: Finding Similar Items-Applications of Near-Neighbor Search, Shingling of Documents, Similarity-Preserving Summaries of Sets, Distance Measures. **Streaming Data:** Mining Data Streams-The Stream Data Model, Sampling Data in a Stream, Filtering Streams.

UNIT - III

Link Analysis-PageRank, Efficient Computation of PageRank, Link Spam. **Frequent Itemsets -** Handling Larger Datasets in Main Memory, Limited-Pass Algorithms, Counting Frequent Items in a Stream. **Clustering-**The CURE Algorithm, Clustering in Non-Euclidean Spaces, Clustering for Streams and Parallelism.

UNIT - IV

Advertising on the Web-Issues in On-Line Advertising, On-Line Algorithms, The Matching Problem, The Adwords Problem, Adwords Implementation. **Recommendation Systems -** A Model for Recommendation Systems, Content-Based Recommendations, Collaborative Filtering, Dimensionality Reduction, The NetFlix Challenge.

UNIT - V

Mining Social-Network Graphs-Social Networks as Graphs, Clustering of Social-Network Graphs, Partitioning of Graphs, Simrank, Counting Triangles.

TEXT BOOKS:

1. Jure Leskovec, Anand Rajaraman, Jeff Ullman, Mining of Massive Datasets, 3rd Edition.

REFERENCE BOOKS:

1. Jiawei Han & Micheline Kamber, Data Mining – Concepts and Techniques 3rd Edition Elsevier.
2. Margaret H Dunham, Data Mining Introductory and Advanced topics, PEA.
3. Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufmann.

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DS861PE: PRINCIPLES OF ENTREPRENEURSHIP
(Professional Elective-VI)

UNIT - I

Introduction to Entrepreneurship: Definition of Entrepreneur Entrepreneurial Traits. Entrepreneur vs Manager, creating and starting the venture: sources of new ideas, method of generating ideas, creative problem solving – writing business plan, evaluating business plans. Launching formalities.

UNIT - II

Financing and Managing the new ventures: sources of capital, record keeping, recruitment, motivating and leading teams, financial controls. Marketing and sales controls. E-commerce and Entrepreneurship, internet advertising – new venture expansion strategies and issues.

UNIT - III

Industrial Financial Support: schemes and functions of directorate of industries, District industries centre (DICs) Industrial development corporation (IDC), State Financial corporation (SFCs), small scale industries development corporation (SSIDCs) Khadhi and village industries commission (KVIC) Technical Consultancy organization (TCO), Small industries service institute (SISI), national small industries corporation (NSIC), small industries development bank of India (SIDBI).

UNIT - IV

Production and marketing management: Thrust areas of production management, selection of production techniques, plant utilization and maintenance, designing the work place, inventory control, material handling and quality control. Marketing functions, market segmentation market research and channels of distribution, sales promotion and product pricing.

UNIT - V

Labour legislation, salient provision of health, safety, and welfare under Indian factories Act, Industrial dispute act, employees state insurance act, workmen's compensation act and payment of bonus act

TEXT BOOKS:
1.   Robert Hisrich, & Michael Peters: Entrepreneurship, TMH, 2009.
2.   Dollinger: Entrepreneurship, Pearson, 2009.

REFERENCE BOOKS:
1.   Vasant Desai, Dynamics of Entrepreneurial Development and Management, Himalaya Publish- ing House, 2009.

2.   Harvard Business Review on Entrepreneurship, HBR Paper Back.

3.   Robert J. Calvin: Entrepreneurial Management, TMH, 2009.

4.   Gurmeet Naroola: The entrepreneurial Connection, TMH, 2009.

5.   Bolton & Thompson: Entrepreneurs—Talent, Temperament and Techniques, Butter-worthHeine- mann, 2009.

6.   Agarwal: Indian Economy, Wishwa Prakashan 2009.

7.   Dutt & Sundaram: Indian Economy, S. Chand, 2009.

8.   B D Singh.: Industrial Relations & Labour Laws, Excel, 2009.

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DS862PE: INTERNET OF THINGS
(Professional Elective-VI)

Course Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web based services on IoT devices

Course Outcomes:

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect them to network.
- Appraise the role of IoT protocols for efficient network communication.
- Elaborate the need for Data Analytics and Security in IoT.
- Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

UNIT - I

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, Iot Communication APIs IoT enabaled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle

UNIT - II

IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

UNIT - III

Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib

UNIT - IV

IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Pro-

gramming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

UNIT - V

IoT Physical Servers and Cloud Offerings – 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

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

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DS863PE: BLOCK CHAIN TECHNOLOGY
(Professional Elective-VI)

Prerequisites

1.   Knowledge in security and applied cryptography;

2.   Knowledge in distributed databases

Course Objectives

•   To Introduce block chain technology and Cryptocurrency

Course Outcomes

•   Learn about research advances related to one of the most popular technological areas today.

UNIT- I

Introduction: Block chain or distributed trust, Protocol, Currency, Cryptocurrency, How a Cryptocurrency works, Crowdfunding

UNIT- II

Extensibility of Blockchain concepts, Digital Identity verification, Block chain Neutrality, Digital art, Blockchain Environment

UNIT- III

Blockchain Science: Grid coin, Folding coin, Blockchain Genomics, Bitcoin MOOCs

UNIT- IV

Currency, Token, Tokenizing, Campus coin, Coin drop as a strategy for Public adoption, Currency Multiplicity, Demurrage currency

UNIT- V

Technical challenges,   Business model   challenges, Scandals and Public perception, Government Regulations

Textbooks:

1.   Blockchain Blue print for Economy by Melanie Swan

2.   Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

References:

1.   Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st Edition, by DanielDrescher .

2.   Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System

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CS851PE/AI864PE/DS864PE: DEEP LEARNING
(Professional Elective-VI)
(Common to CSE/CSD/CSM)

Course Objectives

By the end of the course, students will be able to

* understand complexity of Deep Learning algorithms and their limitations
* understand modern notions in data analysis oriented computing;
* Be capable of confidently applying common Deep Learning algorithms in practiceand implementing their own;
* Be capable of performing distributed computations;
* Be capable of performing experiments in Deep Learning using real-world data.

Course Outcomes:

By the end of this deep learning course with Tensor Flow, the student will be able to

* Understand the concepts of Tensor Flow, its main functions, operations and the execution pipeline
* Implement deep learning algorithms, understand neural networks and traverse the layers of data abstraction which will empower the student to understand data moreprecisely.
* Learn topics such as conventional neural networks, recurrent neural networks, training deep networks and high-level interfaces
* Build deep learning models in Tensor Flow and interpret the results
* Understand the language and fundamental concepts of artificial neural networks
* Troubleshoot and improve deep learning models
* Build own deep learning project
* Differentiate between machine learning, deep learning and artificial intelligence

UNIT-I

Introduction to Tensor Flow: Computational Graph, Key highlights, Creating a Graph,Regression example, Gradient Descent, Tensor Board, Modularity, Sharing Variables, eras

Perceptions: What is a Perception, XOR Gate

UNIT-II

Activation Functions: Sigmoid, ReLU, Hyperbolic Fns, Softmax

Artificial Neural Networks: Introduction, Perceptron Training Rule, Gradient Descent Rule

UNIT- III

Gradient Descent and Back propagation: Gradient Descent, Stochastic Gradient Descent, Back propagation, Some problems in ANN

Optimization and Regularization: Overfitting and Capacity, Cross Validation, Feature Selection,

Regularization, Hyperparameters

UNIT-IV

Introduction to Convolutional Neural Networks: Introduction to CNNs, Kernel filter, Principles behind CNNs, Multiple Filters, CNN applications **Introduction to Recurrent Neural Networks:** Introduction to RNNs, Unfolded RNNs,Seq2Seq RNNs, LSTM, RNN applications

UNIT-V

Deep Learning applications: Image Processing, Natural Language Processing,Speech Recognition, Video Analytics

TEXT BOOKS:

1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016.
2. Francois Chollet, "Deep Learning with Python", Manning Publications, 2018

References:

1. Bishop, C. ,M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education,2004.
5. Phil Kim, "Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence" A press, 2017.
6. Ragav Venkatesan, Baoxin Li, "Convolutional Neural Networks in Visual Computing", CRC Press, 2018

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DS811OE: DATA VISUALIZATION TECHNIQUES
(Open Elective-III)

Course Objective: To understand various data visualization techniques.

Course Outcomes:

- Visualize the objects in different dimensions.
- Design and process the data for Virtualization.
- Apply the visualization techniques in physical sciences, computer science, applied mathematics and medical science.
- Apply the virtualization techniques for research projects. (K1, K3).

UNIT - I

Introduction and Data Foundation: Basics - Relationship between Visualization and Other Fields - The Visualization Process - Pseudo code Conventions - The Scatter plot. Data Foundation - Types of Data - Structure within and between Records - Data Preprocessing - Data Sets

UNIT - II

Foundations for Visualization: Visualization stages - Semiology of Graphical Symbols - The Eight Visual Variables - Historical Perspective - Taxonomies - Experimental Semiotics based on Perception Gibson's Affordance theory – A Model of Perceptual Processing.

UNIT - III

Visualization Techniques: Spatial Data: One-Dimensional Data - Two-Dimensional Data – Three- Dimensional Data - Dynamic Data - Combining Techniques. **Geospatial Data:** Visualizing Spatial Data

- Visualization of Point Data -Visualization of Line Data - Visualization of Area Data - Other Issues in Geospatial Data Visualization **Multivariate Data:** Point-Based Techniques - Line- Based Techniques - Region-Based Techniques - Combinations of Techniques – Trees Displaying Hierarchical Structures – Graphics and Networks- Displaying Arbitrary Graphs/Networks.

UNIT - IV

Interaction Concepts and Techniques: Text and Document Visualization: Introduction - Levels of Text Representations - The Vector Space Model - Single Document Visualizations -Document Collection Visualizations - Extended Text Visualizations **Interaction Concepts**: Interaction Operators - Interaction Operands and Spaces - A Unified Framework. **Interaction Techniques**: Screen Space - Object-Space -Data Space -Attribute Space- Data Structure Space - Visualization Structure - Animating Transformations -Interaction Control

UNIT - V

Research Directions in Virtualizations: Steps in designing Visualizations – Problems in designing effective Visualizations- Issues of Data. Issues of Cognition, Perception, and Reasoning. Issues of System Design Evaluation, Hardware and Applications.

TEXT BOOKS:

1. Matthew Ward, Georges Grinstein and Daniel Keim, "Interactive Data Visualization Foundations, Techniques, Applications", 2010.
2. Colin Ware, "Information Visualization Perception for Design", 2nd edition, Margon Kaufmann Publishers, 2004.

REFERENCE BOOKS:

1. Robert Spence "Information visualization – Design for interaction", Pearson Education, 2nd Edition, 2007.
2. Alexandru C. Telea, "Data Visualization: Principles and Practice," A. K. Peters Ltd, 2008.

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DS812OE: SCRIPTING LANGUAGES
(Open Elective-III)

Course Objectives:

- This course introduces the script programming paradigm
- Introduces scripting languages such as Perl, Ruby and TCL.
- Learning TCL

Course Outcomes:

- Comprehend the differences between typical scripting languages and typical system and application programming languages.
- Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select an appropriate language for solving a given problem.
- Acquire programming skills in scripting language

UNIT - I

Introduction: Ruby, Rails, The structure and Excution of Ruby Programs, Package Management with RUBYGEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Webservers, SOAP and web-services

RubyTk – Simple Tk Application, widgets, Binding events, Canvas, scrolling

UNIT - II

Extending Ruby: Ruby Objects in C, the Jukebox extension, Memory allocation, Ruby Type System, Embedding Ruby to Other Languages, Embedding a Ruby Interperter

UNIT - III

Introduction to PERL and Scripting

Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL-Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT - IV

Advanced perl

Finer points of looping, pack and unpack, filesystem, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Isses.

UNIT - V TCL

TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface.

Tk

Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding, Perl-Tk.

TEXT BOOKS:

1.   The World of Scripting Languages, David Barron,Wiley Publications.
2.   Ruby Progamming language by David Flanagan and Yukihiro Matsumoto O'Reilly
3.   "Programming Ruby" The Pramatic Progammers guide by Dabve Thomas Second edition

REFERENCE BOOKS:

1.   Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J. Lee and B. Ware (Addison Wesley) Pearson Education.
2.   Perl by Example, E. Quigley, Pearson Education.
3.   Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
4.   Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5.   Perl Power, J. P. Flynt, Cengage Learning.

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DS813OE: COMPUTER NETWORKS
(Open Elective-III)

Course Objectives

1. The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks.

2. Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers.

Course Outcomes

1. Gain the knowledge of the basic computer network technology.

2. Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.

3. Obtain the skills of subnetting and routing mechanisms.

4. Familiarity with the essential protocols of computer networks, and how they can be applied in network design and implementation.

UNIT - I

Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet.

Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission.

UNIT - II

Data link layer: Design issues, framing, Error detection and correction.

Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel.

Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat, Example data link protocols.

Medium Access sub layer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, Data link layer switching.

UNIT - III

Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the internet.

UNIT - IV

Transport Layer: Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols.

UNIT - V

Application Layer –Domain name system, SNMP, Electronic Mail; the World WEB, HTTP, Streaming audio and video.

TEXT BOOK:

1.   Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI

REFERENCE BOOKS:

1.   An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education

2.   Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

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B.TECH IV Year II Sem. **L T P C**

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DS814OE: PYTHON PROGRAMMING
(Open Elective-III)

Course Objectives: This course will enable students to

- Learn Syntax and Semantics and create Functions in Python.
- Handle Strings and Files in Python.
- Understand Lists, Dictionaries and Regular expressions in Python.
- Implement Object Oriented Programming concepts in Python.
- Build Web Services and introduction to Network and Database Programming in Python.

Course Outcomes: The students should be able to:

- Examine Python syntax and semantics and be fluent in the use of Python flow control andfunctions.
- Demonstrate proficiency in handling Strings and File Systems.
- Create, run and manipulate Python Programs using core data structures like Lists, Dictionariesand use Regular Expressions.
- Interpret the concepts of Object-Oriented Programming as used in Python.
- Implement exemplary applications related to Network Programming, Web Services and Databases in Python.

UNIT - I

Python Basics, Objects- Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types.

Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules

Sequences - Strings, Lists, and Tuples, Mapping and Set Types

UNIT - II

FILES: File Objects, File Built-in Function [open()], File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules

Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, *Creating Exceptions, Why Exceptions (Now)?, Why Exceptions at All?, Exceptions and the sys Module, Related Modules
Modules: Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, ModuleBuilt-in Functions, Packages, Other Features of Modules

UNIT - III

Regular Expressions: Introduction, Special Symbols and Characters, Res and Python Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the GlobalInterpreter Lock, Thread Module, Threading Module, Related Modules

UNIT - IV

GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, RelatedModules and Other GUIs

WEB Programming: Introduction, Wed Surfing with Python, Creating Simple Web Clients, Advanced Web Clients, CGI-Helping Servers Process Client Data, Building CGI Application ,Advanced CGI, Web (HTTP) Servers

UNIT – V

Database Programming: Introduction, Python Database Application Programmer's Interface (DB-API), Object RelationalManagers (ORMs), Related Modules

TEXT BOOK:

1.   Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

REFERENCE BOOKS:

1.   Think Python, Allen Downey, Green Tea Press
2.   Introduction to Python, Kenneth A. Lambert, Cengage
3.   Python Programming: A Modern Approach, Vamsi Kurama, Pearson
4.   Learning Python, Mark Lutz, O'Really.

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DS801PROJ: SEMINAR

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DS802PROJ: PROJECT STAGE –II