G. Pullaiah College of Engineering and Technology

(Autonomous)

(Approved by AICTE | NAAC Accreditation with 'A' Grade | Accredited by NBA (CSE, ECE & EEE) | Permanently Affiliated to JNTUA)

Nandikotkur Road, Venkayapalli (V), Kurnool - 518452, Andhra Pradesh

BACHELOR OF TECHNOLOGY

ACADEMIC REGULATIONS
GPCET – R20

B.Tech Regular Four Year Degree Programme
(for the batches admitted from the academic year 2020- 2021)
&
B.Tech (Lateral Entry Scheme)
(for the batches admitted from the academic year 2021 - 2022)

Preliminary Definitions and Nomenclature

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 Nehru Technological University Ananthapur**).

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 and one even.

Branch: Means specialization in a program like B.Tech degree program in Civil 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 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.

Certificate Course: It is a course that makes a student to have hands-on expertise and skills required for holistic development in a specific area/field.

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

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 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 overall 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.

Detention in a Semester: Student who does not obtain minimum prescribed attendance in a Semester shall be detained in that particular Semester. Also a Student can also be detained for lack of required number of credits till II-I/III-I at the end of Second year or Third Year respectively

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 examinations 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.

Institute: Means G.Pullaiah College of Engineering and Technology, Kurnool unless indicated otherwise by the context.

Massive Open Online Courses (MOOC): MOOCs inculcate the habit of self-learning. MOOCs 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); PG degree program: Master of Technology (M.Tech) / Master of Business Administration (MBA).

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.

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 "GPCET Regulations – R20" and are binding on all the stakeholders.

Semester: It is a period of study consisting of 16 to 18 weeks of academic work equivalent to normally90 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.

Program 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 behavioural.

University: Means Jawaharlal Nehru Technological University Ananthapur (JNTUA), Ananthapuramu.

G. Pullaiah College of Engineering and Technology
(Autonomous)
Academic Regulations
Regulations for Four Year Bachelor of Technology (B.Tech) Degree programme for the batches admitted from the academic year 2020-21
&
For B.Tech Lateral Entry batches admitted from the academic year 2021 -2022

1. Award of B.Tech. Degree

A student will be declared eligible for the award of the B.Tech. degree if he/she fulfils the following academic regulations:

i. Pursues a course of study for not less than four academic years and in not more than eight academic years. However, for the students availing Gap year facility, this period shall be extended by two years at the most and these two years would not be counted in the maximum time permitted for graduation.

ii. Registers for 160 credits and secures all 160 credits.

iii. The student will be eligible to get Under graduate degree with honours or additional minor engineering if he/she completes an additional 20 credits

iv. A student will be permitted to register either for Honours degree or additional minor engineering but not both.

2. Students, who fail to fulfil all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech. course and their admission stands cancelled.

3. Courses of study

The following courses of study are offered at present as specializations for the B. Tech. course

S.No.	Name of the Branch	Branch Code
1.	Civil Engineering	01
2.	Electrical and Electronics Engineering	02
3.	Mechanical Engineering	03
4.	Electronics and Communication Engineering	04
5.	Computer Science and Engineering	05
6.	Computer Science and Engineering -Artificial Intelligence	31
7.	Computer Science and Engineering -Internet of Things	35

4. Credits:

i. *Credit:* A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (Lecture) or two hours of practical work/field work per week.

ii. *Academic Year:* Two consecutive (one odd + one even) semesters constitute one academic year.

iii. *Choice Based Credit System (CBCS):* The CBCS provides choice for students to select from the prescribed courses.

iv. Each course is assigned certain number of credits based on following

	Semester	
	Periods / Week	Credits
Theory	03	03
Tutorial	01	01
Practical	03	1.5
Internship (IV/VI evaluated in V/VII resp.)	-	1.5/3.0
Project work	-	12

5. Course Structure

Every course of the B.Tech program will be placed in one of the 8 categories with minimum credits as listed below.

S.No.	Category	Category Description	Abbreviated Category	Credits
1	Humanities and social science	Humanities and social science including Management courses	HS	10.5
2	Basic Sciences	Basic Science courses	BS	21
3	Engineering Science courses	Engineering Science Courses including workshop, drawing, basics of electrical/mechanical/compute r etc.	ES	24
4	Professional core	Professional core Courses	PC	51
5	Open Electives	Open Elective Courses- from other technical/ emerging and job oriented	OE	12
6	Professional Courses	Professional Elective Courses relevant to chosen specialization/ branch	PE	18
7	Project Work	Project Work, Seminar, Internship in industry elsewhere	PW	16.5
8	Mandatory courses	Environmental Studies, Induction training, Universal human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge (Non-Credit)	MC	0
9	Skill Oriented Courses	Skill Oriented Courses relevant to domain, interdisciplinary, communication skill, industry	SC	10
		Total Credits		160

6. Weightage for course evaluation

6.1 Course Pattern

- The entire course of study is for four academic years. Semester pattern shall be followed in all years.
- A student eligible to appear for the end examination in a subject, but absent or has failed in the end examination may appear for that subject at the next supplementary examination when offered.
- When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfilment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

6.2 Evaluation Process

The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 100 marks for practical subject. In addition, Internships carried out after IV Semester & VI Semester shall be evaluated for 100 marks each and the Internship along with Project Work carried out in VIII Semester shall be evaluated for 200 marks.

- For theory subjects, the distribution shall be 40 marks for Internal Evaluation and 60 marks for the End-Examination.
- For practical subjects, the distribution shall be 40 marks for Internal Evaluation and 60 marks for the End- Examination.

6.3 Internal Examinations:

i. For theory subjects, during the semester, there shall be two midterm examinations. Each midterm examination consists of objective paper for 10 marks and subjective paper for 30 marks with duration of 1 hour 50 minutes (20 minutes for Objective paper and 90 minutes for subjective paper). The marks obtained in subjective paper will be condensed to 20 marks. The remaining 10 marks shall be awarded based on the submission of assignments by the student.A student has to submit two assignments in every subject each for 10 marks.

ii. The objective paper shall consist of 20 objective questions each carrying 0.5 Mark.

iii. Subjective paper shall be set for 30 marks containing 3 either or descriptive questions of equal weightage of 10 marks and the marks obtained for 3 questions shall be condensed to 20 marks.

***Note 1: T**he marks obtained in the subjective paper shall be condensed to 20 marks, any fraction (0.5 & above) shall be rounded off to the next higher mark.

iv. If the student is absent for the internal examination other than the mandatory courses, no re-exam shall be conducted and internal marks for that examination shall be considered zero.

v. First midterm examination shall be conducted for I, II units of syllabus and second midterm examination shall be conducted for III, IV and V units.

vi. Final Internal marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage to the better mid exam and 20% to the other.

6.4 **End Examinations**:

End examination of theory subjects shall have the following pattern:

There shall be 6 questions and all questions are compulsory. Question 1 shall contain 5 compulsory short answer questions for a total of 10 marks such that each question carries 2 marks. There shall be 2 short answer questions from each unit. In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them. Each of these questions from 2 to 6 shall cover one unit of the syllabus.

End examination of theory subjects consisting of two parts of different subjects, for eg: Electrical & Mechanical Technology, shall have the following pattern:

Question paper shall be in two parts viz., Part A and Part B with equal Weightage. In each part, there shall be 3 either-or type questions for 10 Marks.

Note: The answers for Part A and Part B shall be written in two separate answer books.

6.5 For practical subjects there shall be a continuous evaluation during the semester for 40 sessional marks and end examination shall be for 60 marks. Day-to-day work in the laboratory shall be evaluated for 40 marks by the concerned laboratory teacher based on the regularity/record/ viva. The end examination shall be conducted by the concerned laboratory faculty and senior expert in the same subject of the department.

In a practical subject consisting of two parts (Eg: Electrical & Mechanical Lab), the end examination shall be conducted for 30 marks in each part. Internal examination shall be evaluated as above for 40 marks in each part and final internal marks shall be arrived by considering the average of marks obtained in two parts.

6.6 There shall be mandatory courses with zero credits. There shall be no external examination. However, attendance in the mandatory course shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 40% or more in the internal examinations. In case, the student fails, a re-examination shall be conducted for failed candidates every six months/semester at a mutually convenient date of college/student satisfying the conditions mentioned in item 1 & 2 of the regulations.

6.7 For the subject having design and/or drawing, such as Engineering Drawing, the distribution shall be 40 marks for internal evaluation and 60 marks for end examination.

Day-to-day work shall be evaluated for 10 marks by the concerned subject faculty based on the reports/submissions prepared in the class. And there shall be two midterm examinations in a semester for duration of 2 hours each for 30 marks with consideration of 80% weightage to the better mid exam and 20% to the other for the finalization of Internal marks. The subjective paper shall contain 5 questions of equal weightage of 10 marks and the marks obtained for 3 questions shall be condensed to 20 marks, any fraction (0.5 & above) shall be rounded off to the next higher mark. The sum of day-to-day evaluation and the internal test marks will be the final sessional marks for the subject.

In the end examination pattern for Engineering Drawing there shall be 5 questions, either/or type, of 14 marks each. There shall be no objective type questions in the end examination. However, the end examination pattern for other subjects related to design/drawing is mentioned along with the syllabus.

6.8 There shall be five Professional Elective Courses from V Semester to VII and for each elective there shall be choices such that the student shall choose a course from the list of choice courses offered by the department for that particular elective.

6.9 There shall be four Open Electives/ Job Oriented Courses common to all disciplines from V Semester to VII, where in the students shall choose the electives offered by various departments including his/her own department in such a manner that he/she has not studied the same course in any form during the Programme.

The students shall be permitted to pursue up to a maximum of two elective courses under MOOCs (Massive Open Online Courses) offered by NPTEL notified by the Department during the semester. Each of the Courses must be of minimum 12 weeks in duration. The student has to acquire a certificate for the concerned course from the NPTEL during the semester only in order to earn 3 Credits.

6.10 There shall be a mandatory **induction program** for three weeks before the commencement of first semester.

6.11 **Minor in a discipline** (Minor degree/programme) concept is introduced in the curriculum for all conventional B. Tech programmes in which it offers a major. The main objective of Minor in a discipline is to provide additional learning opportunities for academically motivated students and it is an optional feature of the B. Tech. programme.

a. Students who have a CGPA of 8.0 or above (up to II semester) and without any backlog subjects will be permitted to register for Minor discipline programme. A SGPA and CGPA of 8.0 has to be maintained in the subsequent semesters without any backlog subjects in order to keep the Minor discipline registration active else Minor discipline registration will be cancelled.
b. Students aspiring for a Minor must register at the beginning of IV Semester and must opt for a Minor in a discipline other than the discipline he/she has registered in.
c. In order to earn a Minor in a discipline a student has to earn 20 extra credits by studying four theory subjects each for 4 credits and two MOOCs offered by NPTEL (notified by the Department corresponding to the Minor Programme) each for 2 credits and with a minimum duration of 8 weeks.
d. The student has to acquire a certificate for the concerned course from the NPTEL in order to earn 2 Credits.
e. Students are not allowed to register and pursue more than two courses in any semester. Students may complete the Minor before VIII semester.
f. Each department shall enlist a set of subjects from its curriculum which are core for the discipline without any prerequisites. The Evaluation pattern of theory subjects will be similar to the regular programme evaluation.
g. Students are not allowed to pursue minor discipline programme subjects under Self-study. Classes for the courses of the minor shall be conducted beyond the regular hours.

Student may enlist their choices of Minor discipline programmes in order of preference, to which they wish to join. It will not be permissible to alter the choices after the application has been submitted. However, students are allowed to opt for only one Minor discipline programme in the order of preference given by the student.

h. Minimum strength for offering Minor in a discipline is considered One-Fifth (i.e., 20% of the class) of the class size and Maximum size is Four-Fifth of Class size (i.e., 80% of the class).

i. Completion of a Minor discipline programme requires no addition of time to the regular Four year Bachelors' programme. That is, Minor discipline programme should be completed by the end of final year B. Tech. program along with the major discipline.

j. The Concerned Head of the department will arrange separate course/class work and time table of the various Minor programmes. Attendance regulations for these Minor discipline programmes will be as per regular courses.

k. A Student registered for Minor in a discipline shall pass in all subjects that constitute the requirement for the Minor discipline programme. No class/division (i.e., second class, first class and distinction etc.) shall be awarded for Minor discipline programme.

l. In case a student drops or fails to meet the CGPA requirement for Degree with Minor at any point after registration, he/she will be dropped from the list of students eligible for Degree with Minor and the student will receive regular B.Tech degree only. However, such students will receive a separate grade sheet mentioned the additional courses completed by them.

m. This Minor in a discipline will be mentioned in the degree certificate as Bachelor of Technology in XXX with Minor in YYY. For example, Bachelor of Technology in **Computer Science & Engineering** with Minor in **Electronics & Communication Engineering**. The fact will also be reflected in the transcripts, along with the list of courses for Minor programme with CGPA mentioned separately.

6.12 Honors degree in a discipline:

a. This concept is introduced in the curriculum for all conventional B. Tech. programmes. The main objective of Honors degree in a discipline is to provide additional learning opportunities for academically motivated students and it is an optional feature of the B. Tech. programme.

b. A student shall be permitted to register for Honors program at the beginning of IV Semester provided that the student must have acquired a minimum of 8.0 SGPA up to the end of second semester without any backlogs. SGPA and CGPA of 8.0 has to be maintained in the subsequent semesters without any backlog subjects in order to keep the Honors discipline registration active else Honors discipline registration will stand cancelled.

c. In order to earn the Honors degree in his/her discipline, a student has to earn 20 extra credits by studying four advanced specified courses for 16 credits and acquiring the remaining 4 credits through two MOOCs offered by NPTEL which are domain specific in the branch of Engineering concerned, each for 2 credits and with a minimum duration of 8 weeks.

d. The student has to acquire a certificate for the concerned course from the NPTEL in order to earn 3 Credits.

e. The Evaluation pattern of theory subjects shall be similar to the regular programme evaluation.

f. If a student drops or is terminated from the Honors program, the additional credits earned till that time cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following:

   i. All the courses done under the dropped Honors will be shown in the transcript. (or)

   ii. None of the courses done under the dropped Honors will be shown in the transcript.

g. In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors

and the student will receive regular B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

h. Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor's degree.

6.13 National Service Scheme (NSS)/Yoga is compulsory for all the Undergraduate students. The student participation shall be for a minimum period of 45 hours during the first year. Grades will be awarded as Verygood, Good, Satisfactory in the mark sheet on the basis of participation, attendance, performance and behaviour. If a student gets Unsatisfactory grade, he/she has to repeat the above activity in the subsequent years along with the next year students.

6.14 Students shall undergo two summer internships each for a minimum of six weeks duration at the end of second and third years of the programme for 1.5 credits & 3 credits respectively. The organization in which the student wishes to carry out Internship need to be approved by Internal Department Committee comprising Head of Department and two senior faculty. The student shall submit a detailed technical report along with internship certificate from the Internship organization in order to obtain the prescribed credits. The student shall submit the Internship Project Report along with Certificate of Internship. The evaluation of the first and second summer internships shall be conducted at the end of the V Semester & VII semester respectively.

There shall be internal evaluation for 100 marks and there shall not be external evaluation. The Internal Evaluation shall be made by the departmental committee (Head of the Department and two senior faculty of the department) on the basis of the project report submitted by the student.

Completion of the internship is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such a case, the student shall repeat the internship in the subsequent summer provided that the student doesn't pursue two summer internships in the same summer.

Community Service Project focusing on specific local issues, shall be an alternative to the six weeks of summer Internship, whenever there is any emergency and when students cannot pursue their summer internships. The Community Service Project shall be for 6 weeks in duration which includes preliminary survey for 1 week, community awareness programs for one week, community immersion program in consonance with Government agencies for 3 weeks and a community exit report (a detailed report) for one week. The community service project shall be evaluated for 100 marks by the internal departmental committee comprising Head of the Department and two senior faculty of the department. **However, the first priority shall be given to the internship.**

6.15 There shall also be a mandatory full internship in the final semester (VIII Semester) of the Programme along with the project work. The organization in which the student wishes to carry out the Internship need to be approved by Internal Department Committee Comprising Head of the Department and two senior faculty. The faculty of the respective department monitors the student internship program along with project work. At the end of the semester, the candidate shall submit a certificate of internship and a project report. The project report and presentation shall be internally evaluated for 60 marks by the departmental committee consisting of Head of the Department, Project supervisor and a senior faculty member. The Viva-Voce shall be conducted for 140 marks by a committee consisting of HOD, Project Supervisor and an External Examiner.

Completion of internship is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such a case, the student shall repeat the internship along with project work for next six months.

6.16 There shall be five skill-oriented courses offered during III semester to VII semester. Out of the five skill courses, two shall be skill-oriented programs related to the domain and these two shall be completed in second year. Of the remaining three skill courses, one shall necessarily be a soft skill course and the remaining 2 shall be skill-advanced courses either from the same domain or Job oriented skill courses, which can be of inter disciplinary nature.

The student can choose between a skill advanced course being offered by the college or to choose a certificate course being offered by industries/Professional bodies/APSSDC or any other accredited bodies which are duly approved by the Internal Department Committee. The credits assigned to the skill advanced course shall be awarded to the student upon producing the Course Completion Certificate from the agencies/professional bodies.

The Internal Department Committee comprising Head of Department and two senior faculty shall evaluate the grades/ marks awarded for a course by external agencies and convert to the equivalent marks/grades.

7. Attendance Requirements:

- A student shall be eligible to appear for external examination and promoted to next semester, if he/she acquires a minimum attendance of 40% in every subject (Theory/Laboratory) being offered in that semester along with an aggregate attendance of 75% of all the subjects (Theory/Laboratory) offered in that semester.
- Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee. However, a student who has been condoned for shortage of attendance need to acquire a minimum of 40% in each subject (Theory/ Laboratory) being offered in that semester.
- Shortage of Attendance below 65% in aggregate shall in NO case be condoned.
- Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their examination registration shall stand cancelled.
- A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek re-admission for that semester when offered next.
- A stipulated fee shall be payable towards condonation of shortage of attendance to the college.

8. Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.7

8.1 A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project, if he/she secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together. In case of mandatory courses, internships, project work viva – voce, he/she should secure 40% of the total marks.

8.2 A student shall be promoted from II to III year only if he/she fulfils the academic requirement of securing 40% of the credits in the subjects that have been studied up to III Semester from the following examinations.

One regular and two supplementary examinations of I Semester.
One regular and one supplementary examination of II Semester.
One regular examination of III semester.

8.3 A student shall be promoted from III year to IV year only if he/she fulfils the academic requirements of securing 40% of the credits in the subjects that have been studied up to V semester from the following examinations, irrespective of whether the candidate takes the end examination or not as per the normal course of study.

One regular and four supplementary examinations of I Semester.
One regular and three supplementary examinations of II Semester.
One regular and two supplementary examinations of III Semester.
One regular and one supplementary examinations of IV Semester.
One regular examination of V Semester.

And if a student is detained for want of credits for particular academic year by sections 8.2 and 8.3 above, the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the V Semester or VII Semester as the case may be.

8.4 A student shall register and put up minimum attendance in all 160 credits and earn all the 160 credits. Marks obtained in all 160 credits shall be considered for the calculation of aggregate percentage of marks obtained.

8.5 Students who fail to earn 160 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit their seat in B.Tech. course and their admission shall stand cancelled.

9. Course Pattern:

(i) A student eligible to appear for the end examination in a subject, but absent or has failed in the end examination may appear for that subject at the next supplementary examination when offered.

When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfilment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

(ii) **With–holding of Results**:

If any case of indiscipline or malpractice is pending against candidate, the result of the candidate shall be with held and he/she will not be allowed/promoted into the next higher semester. The issue of awarding degree is liable to be withheld in such cases.

(iii) Grading

After each subject is evaluated for 100 marks, the marks obtained in each subject will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Table – Conversion into Grades and Grade Points assigned

Range in which the marks in the subject fall	Grade	Grade Points Assigned
≥ 90	S (Superior)	10
80-89	A (Excellent)	9
70-79	B (Very Good)	8
60-69	C (Good)	7
50-59	D (Average)	6
40-49	E (Below Average)	4
< 40	F (Fail)	0
Absent	Ab (Absent)	0

A student obtaining Grade F shall be considered failed and will be required to reappear for that subject when the next supplementary examination offered. Same is the case with a student who obtains 'Ab' in end examination.

For **mandatory** courses "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

10. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

(i) The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$\text{SGPA} = \frac{\sum_{i=1}^{n} C_i \times GP_i}{\sum_{i=1}^{n} C_i}$$

where, C_i is the number of credits of the i^{th} subject and GP_i is the grade point scored by the student in the i^{th} course.

(ii) The Cumulative Grade Point Average (CGPA) will be computed in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.,

$$\text{CGPA} = \frac{\sum_{j=1}^{m} SGPA_j \times TC_j}{\sum_{j=1}^{m} TC_j}$$

where "$SGPA_j$" is the SGPA of the j^{th} semester and TC_j is the total number of credits in that semester.

(iii) Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

(iv) While computing the SGPA, the subjects in which the student is awarded Zero grade points will also be included.

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

(vi) *Letter Grade:* It is an index of the performance of students in a said course. Grades are denoted by letters S, A, B, C, D, E and F.

11. Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. degree, he/she shall be placed in one of the following four classes.

Class Awarded	**CGPA Secured**
First Class with Distinction	≥ 7.5
First Class	≥ 6.5 < 7.5
Second Class	≥ 5.5 < 6.5
Pass Class	≥ 4.0 < 5.5

12. Gap Year:

Gap year concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after II year to pursue entrepreneurship full time. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. An evaluation committee shall be constituted by the College to evaluate the proposal submitted by the student and the committee shall decide whether or not to permit the student(s) to avail the Gap Year.

13. Transitory Regulations:

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, and they will be in the academic regulations into which they get readmitted.

Candidates who were permitted with Gap Year shall be eligible for rejoining into the succeeding year of their B. Tech from the date of commencement of class work, and they will be in the academic regulations into which the candidate is presently re-joining.

14. Minimum Instruction Days:
The minimum instruction days including exams for each semester shall be 90 days.

15. Medium of Instruction
The Medium of Instruction is **English** for all courses, laboratories, internal and external examinations and project reports.

16. Rules of Discipline

(i) Use of mobile phones with camera, in the campus is strictly prohibited.

(ii) Students shall behave and conduct themselves in a dignified and courteous manner in the campus/Hostels.

(iii) Students shall not bring outsiders to the institution or hostels.

(iv) Students shall not steal, deface, damage or cause any loss to the institution property.

(v) Students shall not collect money either by request or coercion from others within the campus or hostels.

(vi) Students shall not resort to plagiarism of any nature/extent. Use of material, ideas, figures, code or data without appropriate acknowledgement or permission of the original source shall be treated as cases of plagiarism. Submission of material, verbatim or paraphrased, that is authored by another person or published earlier by oneself shall also be considered as cases of plagiarism.

(vii) Use of vehicles by the students inside the campus is prohibited.

(viii) Any conduct which leads to lowering of the esteem of the organization is prohibited.

(ix) Any material to be uploaded to social media sites need to be approved by Head of the Department concerned/Dean/Principal.

(x) Any student exhibiting prohibited behaviour shall be suspended from the institute. The period of suspension and punishment shall be clearly communicated to the student. The student shall lose the attendance for the suspended period

(xi) Dress Code

Boys : All the boy students should wear formal dresses. Wearing T-shirts and other informal dresses in the campus is strictly prohibited.

Girls : All the girls students shall wear saree/chudidhar with dupatta

17. Punishments for Malpractice cases – Guidelines

The examinations committee may take the following guidelines into consideration while dealing with the suspected cases of malpractice reported by the invigilators/squad members etc; during end examinations. The punishment may be more severe or less severe depending on the merits of the individual cases.

S.No.	Nature of Malpractice/Improper conduct	Punishment
1	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cellphones, pager, palm computers or any other form of material concerned with or related to the course of the examination (theory or practical) in which he 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 course of the examination).	Expulsion from the examination hall and cancellation of the performance in that course only.
2	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or	Cancellation of the performance in that course.

	writes to the examiner requesting him to award pass marks.	
3	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that course and all other courses the candidate has appeared including practical examinations and project work of that semester/year examinations.
4	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any other 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 course only of all the students involved. In case of an outsider, he will be handed over to the police and a case shall be registered against him.
5	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year.
6	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year.
7	Smuggles in the Answer book or takes out or arranges to send out the question paper during the examination or answer book during or after the examination	Expulsion from the examination hall and cancellation of performance in that course and all the other courses including practical examinations and project work of that semester/year. The student is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeit of seat.
8	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	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses 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 shall be registered against them.

	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.	
9	Leaves the exam hall taking away answer script or intentionally tears up the script or any part there of inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses including practical examinations and project work of that semester/year. The candidate is also debarred for two consecutive semesters from classwork and all end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
10	Possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year. The student is also debarred and forfeits the seat.
11	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in S.No7 to S.No 9.	For Student of the college: Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case shall be registered against them.
12	Impersonates any other student in connection with the examination	The student who has impersonated shall be expelled from examination hall. The student is debarred from writing the remaining exams, and rusticated from the college for one academic year during which period the student will not be permitted to write any exam. If the imposter is an outsider, he will be handed over to the police and a case shall be registered against him. The performance of the original student who has been impersonated, shall be cancelled in all the courses of the examination including practicals and project work of

		that semester/year. The student is rusticated from the college for two consecutive years during which period the student will not be permitted to write any exam. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
13	If any malpractice is detected which is not covered in the above S.No 1 to S.No 12 items, it shall be reported to the college academic council for further action and award suitable punishment.	
14	Malpractice cases identified during sessional examinations will be reported to the examination committee nominated by Academic council to award suitable punishment.	

ACADEMIC REGULATIONS FOR B. TECH.(R20)
(LATERAL ENTRY SCHEME)

(Effective for the students getting admitted into II year through Lateral Entry Scheme from the Academic Year 2021-2022 and onwards)

1. Award of B.Tech. Degree

A student admitted in Lateral Entry Scheme (LES) will be declared eligible for the award of the B.Tech degree if he fulfils the following academic regulations:

(a) Pursues a course of study for not less than three academic years and in not more than six academic years.
(b) Registers for 121 credits and secures all *121* credits from III semester to VIII semester of Regular B. Tech. program.
(c) Students, who fail to fulfil the requirement for the award of the degree in six consecutive academic years from the year of admission, shall forfeit their seat.
(d) The regulations **3** to 7 are to be adopted as that of B. Tech. (Regular).

2. Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.7.

i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he/she secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together. For the Seminar & Comprehensive viva-voce he should secure 40% in the internal evaluation.

ii. A student shall be promoted from third year to fourth year only if he/she fulfils the academic requirements of *40%* credits obtained till III-I from the following examinations, irrespective of whether the candidate takes the end examination or not as per the normal course of study.

One regular and Two supplementary examinations of III semester.
One regular and one supplementary examinations of IV semester.
One regular examination of V semester.

And in case a student is already detained for want of credits for particular academic year, the student may make up the credits through supplementary exams of the above exams before the commencement of VII semester class work of next year.

3. Course Pattern

- The entire course of study is three academic years on semester pattern.
- A student eligible to appear for the end examination in a subject, but absent at it or has failed in the end examination may appear for that subject at the next supplementary examination offered.
- When a student is detained due to lack of credits/shortage of attendance he may be re-admitted when the semester is offered after fulfilment of academic regulations, he shall be in the academic regulations into which he is readmitted.

4. The regulations **9** to **10** are to be adopted as that of B. Tech. (Regular).

5. Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he/she shall be placed in one of the following four classes:

Class Awarded	**CGPA Secured**	From the Aggregate Marks secured for 121 Credits (i.e II Year to IV Year)
First Class with Distinction	≥ 7.5	
First Class	≥ 6.5 < 7.5	
Second Class	≥ 5.5 < 6.5	
Pass Class	≥ 4.0 < 5.5	

6. The regulations **11** to **17** are to be adopted as that of B. Tech. (Regular). All other regulations as applicable for B. Tech. Four-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

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PROGRAMME CURRICULUM STRUCTURE UNDER R20 REGULATIONS

B. TECH – COMPUTER SCIENCE AND ENGINEERING- DATA SCIENCE (CSD)

0 SEMESTER (I YEAR)									
S.No	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
20SIP01	Physical Activities - Sports, Yoga and Meditation, Plantation	MC	0	0	6	0	-	-	-
20SIP02	Career Counselling/Lectures by eminent people	MC	2	0	2	0	-	-	-
20SIP03	Orientation to all branches - career options, tools, etc.	MC	3	0	0	0	-	-	-
20SIP04	Orientation on admitted Branch - corresponding labs, tools and platforms	EC	1	0	4	0	-	-	-
20SIP05	Proficiency Modules & Productivity Tools	ES	2	1	2	0	-		-
20SIP06	Assessment on basic aptitude and mathematical skills	MC	1	0	4	0	-	-	-
20SIP07	Remedial Training in Foundation Courses	MC	2	1	2	0	-	-	-
20SIP08	Universal Human Values, painting, sculpture, pottery, music, dance	MC	1	0	2	0	-	-	-
20SIP09	Communication Skills - focus on Listening, Speaking, Reading, Writing skills, debates, enacting a play.	BS	2	1	2	0	-	-	-
		TOTAL	14	3	24	0			-

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

PROGRAMMECURRICULUM STRUCTURE UNDER R20 REGULATIONS

B. TECH – COMPUTER SCIENCE AND ENGINEERING- DATA SCIENCE (CSD)

I SEMESTER (I YEAR)

S.NO	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A30002	Mathematics-I	BS	3	0	0	3	30	70	100
A30004	Applied Physics	BS	3	0	0	3	30	70	100
A30501	Python Programming	ES	3	0	0	3	30	70	100
A30001	Communicative English	HS	3	0	0	3	30	70	100
A30301	Engineering Graphics and Computer aided Drafting	ES	1	0	4	3	30	70	100
A30006	Communicative English Lab	HS	0	0	3	1.5	30	70	100
A30008	Applied Physics Lab	BS	0	0	3	1.5	30	70	100
A30502	Python Programming Lab	ES	0	0	3	1.5	30	70	100
	TOTAL		13	00	13	19.5	240	560	800

II SEMESTER (I YEAR)

S.NO	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A30011	Probability & Statistics	BS	3	0	0	3	30	70	100
A30005	Chemistry	BS	3	0	0	3	30	70	100
A30503	Data Structures Using C	ES	3	0	0	3	30	70	100
A33101	Fundamentals of AI	ES	3	0	0	3	30	70	100
A30302	Engineering Workshop	ES	1	0	4	3	30	70	100
A30009	Chemistry Lab	BS	0	0	3	1.5	30	70	100
A30504	Data Structures Lab	ES	0	0	3	1.5	30	70	100
A33102	Basic AI Lab	ES	0	0	3	1.5	30	70	100
A30032	Universal Human Values	MC	2	0	0	0	100*	-	100*
	TOTAL		15	00	13	19.5	240	560	800

* The marks for Mandatory Courses are not considered for calculating SGPA

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30002 – MATHEMATICS – I

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course offers more advanced topics of mathematics required to analyze the problems in engineering. Topics to be covered in this course include: Solution of system of linear equations, Eigen values and Eigen vectors, Quadratic forms, Functions of single variable, Roll'stheorem, legranges mean value theorem, Cauchy mean value theorem, multivariable calculus, jacobian, maxima & minima. Evaluate the double and Triple integrals and its applications, Special functions. The mathematical skills derived from this course provides necessary base to analytical and theoretical concepts occurring in the program

Course Pre/co requisites

- Linear Algebra
- Differentiation
- Integration

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A30002.1 Develop the use of matrix algebra techniques that is needed by engineers for practical Applications.

A30002.2 Interpret the Eigen values and Eigen vectors of matrix in terms of the transformation it represents in to a matrix Eigen value problem.

A30002.3 Utilize mean value theorems to real life problems.

A30002.4 Familiarize with functions of several variables which is useful in optimization.

A30002.5 Apply important tools of calculus in higher dimensions and will become familiar with 2-dimensional coordinate systems.

A30002.6 Analyze 3- dimensional coordinate systems and utilization of special functions.

3. Course Syllabus

UNIT-I: Matrix Operations and Solving Systems Of Linear Equations

Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Clayey-Hamilton theorem (without proof), finding inverse and power of a matrix by Clayey-Hamilton theorem, Diagonalisation of a matrix.

UNIT-II: Quadratic forms

Quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof).

UNIT-III: Multivariable Calculus

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers with three variables only**.**

UNIT-IV: Double Integrals

Double integrals, change of order of integration change of variable from Cartesian to polar coordinates, double integration in polar coordinates, areas enclosed by plane curves**.**

UNIT-V:TripleIntegrals and Special Functions

Evaluation of triple integrals, change of variables between Cartesian, cylindrical and spherical polar co-ordinates, Beta and Gamma functions and their properties, relation between beta and gamma functions.

4. Books and Materials

Text Books:

1. Erwin Kreyszig, *Advanced Engineering Mathematics,* 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, *Higher Engineering Mathematics*, 44/e, Khanna publishers, 2017.

Reference Books:

1. R. K. Jain and S. R. K. Iyengar, *Advanced Engineering Mathematics*, 3/e, Alpha Science International Ltd., 2002.
2.George B. Thomas, Maurice D. Weir and Joel Hass, *Thomas Calculus,* 13/e, Pearson Publishers, 2013.
3. Glyn James, *Advanced Modern Engineering Mathematics*, 4/e, Pearson publishers, 2011.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30004-APPLIED PHYSICS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The laws of physics play a key role in the development of science, engineering and technology. Sound knowledge of physical principles is of paramount importance in understanding new discoveries, recent trends and latest developments in the field of engineering. To keep in pace with the recent scientific advancements in the areas of emerging technologies, the syllabi of Applied physics has been thoroughly revised keeping in view of the basic needs of all engineering branches by including the topics like physical optics, properties of dielectric and magnetic materials, electromagnetic theory, fiber optics, semiconductors, superconductivity are introduced. The applications of nano materials relevant to engineering branches are to be familiarized.

Course Pre/co-requisites

Bridge Course

2. Course Outcomes (COs)

After completion of the course, the learner will be able to:

A30004.1	Interpret the properties of light waves and its interaction of energy with the matter
A30004.2	Explain the principles of physics in dielectrics and magnetic materials
A30004.3	Apply electromagnetic wave propagation in different guided media
A30004.4	Calculate conductivity of semiconductors
A30004.5	Interpret the difference between normal conductor and super conductor
A30004.6	Elucidate the applications of nano materials

3. Course Syllabus

UNIT-I **12hrs**

Physical Optics

Interference: Superposition Principle-Interference of light -Interference in thin films by reflection -Newton's Rings-Determination of Wavelength-Engineering applications of Interference.

Diffraction-Fraunhofer Diffraction-Single slit, double slit, multiple slit diffraction-Diffraction Grating – Grating Spectrum -Determination of Wavelength-Engineering applications of Diffraction

Polarization-Polarization by double refraction-Nicol's Prism--Half wave and Quarter wave plate-Engineering applications of Polarization.

UNIT II

Dielectric and Magnetic Materials **8 hrs**

Dielectric Materials: Introduction to Dielectrics - Types of polarizations-Electronic and ionic polarizations with mathematical Derivations-orientation polarization(quantitative) -Frequency dependence of polarization-Lorentz(internal) field-Claussius -Mosotti equation-Applications of Dielectrics.

Magnetic Materials: Introduction to Magnetics--Classification of Magnetic materials-Weiss theory of ferromagnetism (qualitative)-Hysteresis-soft and hard magnetic materials-Ferrites and garnets and its applications.

UNIT III

Electromagnetic Waves and Fiber Optics **8 hrs**

Electromagnetic Waves: Divergence of Electric and Magnetic Fields-Gauss theorem for divergence-Curl of Electric and Magnetic Fields-Stokes theorem for curl- Maxwell's Equations-Electromagnetic wave propagation in non-conducting media-Poynting's Theorem.

Fiber Optics: Introduction-Total Internal Reflection-Construction of optical fibers, Critical angle of propagation-Acceptance Angle-Numerical Aperture-Classification of optical fibers-Fiber optic Communication system – Applications of optical fibers.

UNIT IV **6 hrs**

Semiconductors

Origin of energy bands - Classification of solids based on energy bands – Intrinsic semi - conductors –carrier concentration of charge carriers-Fermi energy – Electrical conductivity - extrinsic semiconductors - P-type & N-type - carrier concentration of charge carriers - Dependence of Fermi energy on carrier concentration and temperature- Direct and Indirect band gap semiconductors-Hall effect- Hall coefficient - Applications of Hall effect .

UNIT V

Superconductors and Nano materials **8 hrs**

Superconductors: Superconductors-Properties- Meissner effect-BCS Theory- AC & DC Josephson Effect -Types of Superconductors-High T_c superconductors-Applications.

Nanomaterials: Introduction-significance of nanoscale-Basic Principles of Nano materials – Properties of nanomaterials: Optical, Electrical, Thermal, Mechanical and Magnetic properties - Synthesis of nanomaterials: Top-down and bottom-up approach methods-Ball milling-chemical vapour deposition method-Applications of Nano materials.

4. Books and Materials

Text Book(s):

1.P.K.Palaniswamy, "Engineering Physics" ScitechPublications,2011.

2.B.K.Pandey and S.Chaturvedi, "Engineering Physics",Cengage Learning, 2012.

3.K.Thyagarajan, "Applied Physics", Mc Graw Hill Education(India) Private Limited,2020.

Reference Book(s):

1. Shatendra Sharma,Jyotsna Sharma, "Engineering Physics" Pearson Education,2018.

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

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A30501 – PYTHON PROGRAMMING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The course covers the basic programming and demonstrates fundamental programming techniques.

This course helps the students gaining the knowledge to write python language applications, mathematical and engineering problems. Helps to undertake future courses that assume this programming language as a background in computer programming**.**

Course Pre/Co-requisites

The course has no specific prerequisite and co-requisites.

2. Course Outcomes (COs)

After completion of the course, the learner will be able to:

A30501.1 Comprehend the fundamental concepts of computer hardware and problem solving Abilities.

A30501.2 Knowledge on the basic concepts of algorithms, flow charts and python programming.

A30501.3 Ability to analyze the procedure for providing input and acquire output from the program along with implementation of control statements.

A30501.4 Interpret the importance of functions in programming

A30501.5 Analyze and modularize the problem and its solution by using functions.

A30501.6 Ability to relate the concepts of strings, files and pre-processors to the real world Applications.

3. Course Syllabus

Introduction to Computers and Problem Solving Strategies -Introduction, Defining a Computer, History of Computers, Characteristics of Computers, Classification of Computers, Applications of Computers, Components and Functions of a Computer System, Concept of Hardware and Software, Central Processing Unit(CPU),I/O Devices, Computer Memory, Classification of Computer Software, Problem Solving Strategies, Program Design Tools.

Basics of Python Programming – Introduction to computer and python programming, History of python, Basics of python programming, python character set, tokens, data types, output function, multiple assignments, formatting numbers and strings.

Operators and Expressions -Arithmetic Operators, Comparison Operators, Assignment and In-place or Shortcut Operators, Unary Operators, Bitwise Operators, Shift Operators, Logical Operators, Membership Operators, Identity Operators, Operator Precedence and Associatively, Expressions in Python.

Decision statements -Boolean type, Boolean operators, numbers, strings with Boolean operators, decision making statements, conditional expressions.

Loop control statements -while loop, range function, for loop, nested loops, break and continue statements.

Data Structures -Sequence, Lists, Tuples, Sets, Dictionaries. Functional Programming -filter(), map(), reduce() , Python Strings.

Functions -Basics of functions, syntax, use of a function, local and global scope of a variable, return statement, recursive functions, lambda functions, parameters and arguments in functions.

Modules -The from…import statement, Name of Module, Making your own Modules, dir() function, The Python Module, Modules and Namespaces, Packages in Python, Standard Library modules, Globals(), Locals() and Reload(), Function Redefinition.

Exceptions -Introduction, Handling Exceptions, Multiple Except Blocks, else Clause, Raising Exceptions, finally Block, Re-raising Exception.

File Handling -Introduction, Need of file handling, text input and output files, seek function, binary files. Extracting data from a file and performing some basic operations on it.

4. Books and Materials

Text Book(s)

1. Programming and problem solving with python by Ashok NamdevKamthane,Amit Ashok Kamthane., McGraw-Hill Education.
2. Python programming using problem solving approach by ReemaThareja, Oxford.

Reference Book(s)

1. Martin C.Brown, “The Complete Reference: Python”, McGraw-Hill, 2018.
2. Kenneth A. Lambert, B.L. Juneja, “Fundamentals of Python”, CENGAGE, 2015.
3. Allen B. Downey, “Think Python: How to Think like a Computer Scientist”, 2nd Edition, O’Reilly, 2016.

OR

4.http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30001 – COMMUNICATIVE ENGLISH

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview:

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Pre/co-requisites:

The course has no specific pre/co-requisites

Course Outcomes(COs)

After the completion of the course, the student will be able to:

A30001.1 Remember the concepts which the student has learnt previously and identifying their connection

A30001.2 Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English

A30001.3 Apply grammatical structures to formulate sentences and correct word forms

A30001.4 Analyze discourse markers to speak clearly on a specific topic in informal discussions

A30001.5 Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.

A30001.6 Create a coherent paragraph interpreting a figure/graph/chart/table

Course Syllabus

UNIT – I

Listening: Listening for comprehension.
Speaking: Introducing oneself and describing people, places and objects.
Reading: Skimming and scanning pieces of information.
Writing: Summary writing.
Grammar and Vocabulary: Sentences and Clauses. Preposition, Parts of speech. One word substitutes.
Text: On the Conduct of Life: William Hazlitt. If: Rudyard Kipling

UNIT –II

Listening: Listening for purpose.
Speaking: Short structured talks on specific topics.
Reading: Identifyingand recognizing verbal techniques to link the ideas in a paragraph.
Writing: Mechanics of writing. (Punctuation)
Grammar and Vocabulary: Articles. Parts of speech. Synonyms.
Text: The Brook: Alfred Tennyson
Self-Improvement- How I Became a Public Speaker: George Bernard shaw

UNIT –III

Listening: Listening for global comprehension.
Speaking: Discussing and reporting on specific topics.
Reading: Reading for comprehension
Writing: Paragraph writing.
Grammar and Vocabulary: Noun-Pronoun Agreement. Subject-Verb Agreement. Antonyms.
Text: The Death Trap: Saki
Time Management: On Saving Time: Seneca

UNIT –IV

Listening: Predicting conversation/transactional dialogues
Speaking: Role Plays
Reading: Interpreting the graphic elements in the text.
Writing: Information Transfer. Letter writing (formal and Informal). Essay Writing
Grammar and Vocabulary: Misplaced Modifiers. Degrees of Comparisions.
Text: ChinduYellamma
Innovation: Muhammad Yunus

UNIT – V

Listening: Listening comprehension.
Speaking: Formal Oral Presentations.
Reading: Reading for comprehension
Writing: Summary writing. Technical Report writing.
Grammar and Vocabulary: Spotting the errors. Idioms and Phrases.
Text: Politics and the English Language: George Orwell
The Dancer with a White Parasol: Ranjana Dave

4. Books and Materials

Text Book:
Language and Life:A Skills Approach, Orient BlackSwan, Hyderabad. 2018.

Reference Books:

1.Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
2.Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
3.Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30301-ENGINEERING GRAPHICS AND COMPUTER AIDED DRAFTING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
1	0	4	14	0	56	3	30	70	100

1. Course Description

Course Overview

This course teaches the practices for accuracy and clarity in presenting the technical information in the form of drawings and the utility of drafting & modelling packages in orthographic and isometric drawings. It enables the student to understand and develop engineering imagination essential for successful design and familiarize how industry communicates technical information.

Course Pre/co-requisites

The course has no specific prerequisite and co-requisites

2. Course Outcomes (COs)

After completion of the course, the learner will be able to:

A30301.1 Construct various curves like ellipse, parabola, hyperbola etc which are used in Engineering drawing.

A30301.2 Apply orthographic projection concepts to draw projections of points, lines, planes and solids.

A30301.3 Apply development concepts to draw development of surfaces of simple solids.

A30301.4 Apply isometric projection concepts to draw isometric projections of right regular solids

A30301.5 Apply orthographic projection concepts to convert isometric view to orthographic views.

A30301.6 Make use of AutoCAD Software to draw 2D diagrams of various objects

3. Course Syllabus

PART -A

UNIT I

Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance – Drawing Instruments and their Use – Conventions in Drawing – Lettering – BIS Conventions.

Curves used in Engineering Practice:

a) Conic Sections- Ellipse, Parabola & Hyperbola – General method only.

b) Rectangular Hyperbola – General method only.

c) Cycloid, Epicycloids and Hypocycloid

UNIT II

Projection of Points: Principles of Orthographic Projection, Conventions, First and Third Angle Projections, Projections of Points.

UNIT III

Projection of Lines: Projection of Lines in simple positions, inclined to one or both planes, Finding True lengths.

Projections of Planes: Projections of regular Plane surfaces in simple position, inclined to one plane.

UNIT IV

Projections of Solids: Projections of Regular Solids in simple position, axis inclined to one of the planes.

Developments of Solids: Development of Surfaces of Right Regular Solids – Prisms, Cylinder, Pyramid and Cone.

UNIT V

Isometric and Orthographic Projections: Principles of Isometric Projection –Isometric Scale – Isometric Views– Isometric Views of Lines, Plane Figures, Simple Solids(Cube, Prism, Cone & Cylinder).Conversion of Isometric view to Orthographic Views.

PART –B (PRACTICEONLY)

Introduction to Computer Aided Drafting:

Introduction to AutoCAD Software, setting of units and drawing limits, producing drawings by using Absolute, Relative and Polar coordinate input entry methods, drawing simple figures, applying dimensions to objects and Editing options

4. Books and Materials

Text Book(s):

K.L. Narayana and P. Kannaih ,*Engineering Drawing*, Scitech Publications, 2nd edition,2011.

Reference Book(s)

1. N.D. Bhatt*, Engineering Drawing,* Charotar Publishing House,53rd Edition2016.
2. K. Venugopal,*Engineering Drawing and Graphics,* New age International Publishers,5th edition, 2004.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30006 – COMMUNICATIVE ENGLISH LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	30	70	100

1. Course Description

A well equipped and well maintained language lab is maintained in the college to hone the communication skills of students. The students are trained in developing their communication skills through this system. The language lab lessons engaged in this college facilitates classroom engagement and interaction via computer based exercises and activities to maximize language immersion. It focuses on acquiring and developing the four main language skills of a student, namely; listening, speaking, reading and writing along with adequate grammar and vocabulary building exercises as well.

Course Objectives:

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

Course Pre/co requisites

A30001- Communicative English

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A30006.1	Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills
A30006.2	Apply communication skills through various language learning activities
A30006.3	Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
A30006.4	Evaluate and exhibit acceptable etiquette essential in social and professional settings
A30006.5	Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.
A30006.6	Improve upon speaking skills over telephone, role plays and public speaking

3. Course Syllabus

List of topics to be covered:

1. Phonetics for listening comprehension of various accents
2. Reading comprehension
3. Describing objects/places/persons
4. JAM
5. Small talks on general topics (Hypothetical situations)
6. Debates
7. Situational dialogues –Greeting and Introduction
8. Reading passages (TOEFL, IELTS)- Summarizing and Note making.
9. Vocabulary Building
10. Asking for Information and Giving Directions
11. Information Transfer
12. Non-verbal Communication –Dumb Charades
13. Oral Presentations
14. Précis Writing and Paraphrasing
15. Spotting errors

4. Books and Materials

Text Books:

1. *Language and Life:A Skills Approach.* Orient BlackSwan: Hyderabad. 2018.
2. Rizvi, M. Ashraf. Effective Technical Communication. Noida:McGraw-Hill Education. 2009.

Reference Books:

1. Dhanavel, S P. English for Communication Skills for Students of Science and Engineers. New Delhi: Mittal Books India. 2009.
2. Lewis, Norman. Word Power made Easy. Haryana:Penguin Random House India. 2009.
3. Mohan, Krishna and N P Krishna. *Speaking English Effectively.* India: MacMillan.2009.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30008 – APPLIED PHYSICS LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	30	70	100

1. Course Description

Course Overview

This course imparts practical and conceptual knowledge of Physics applicable to the domain of civil and mechanical engineering. The laboratory work of the course is aimed to ensure that the student comprehends the concepts of Physics through demonstrable and executable experiments. This course will enable the student to determine the thickness of paper, radius of curvature of plano-convex lens, wavelength of different colors of white light, dispersive power of grating, self -Inductance of the coil, numerical aperture and acceptance angle of an optical fiber, resistivity and energy gap of a semiconductor, study of magnetic field along the axis of a current carrying coil, diffraction of light through single slit and measurement of resistance by varying temperature.

Course Pre/co-requisites:

A30004- Applied Physics

2. Course Outcomes (COs)

After completion of the course, the learner will be able to:

A30008.1	Operate optical instruments like Travelling microscope and spectrometer
A30008.2	Understand the concepts of interference by finding thickness of paper, radius of curvature of Newton's rings
A30008.3	Interpret the concept of diffraction by the determination of wavelength of different colors of white light and dispersive power of grating
A30008.4	Plot the intensity of the magnetic field of circular coil carrying current with varying distance and B-H curve
A30308.5	Evaluate the acceptance angle of an optical fiber and numerical aperture
A30308.6	Determine the resistivity of the given semiconductor using four probe method, the band gap of a semiconductor

3. Course Syllabus

(Any 12 of the following)

1. Determine the thickness of the paper using wedge shape method
2. Determination of the radius of curvature of the lens by Newton's ring method
3. Determination of wavelength by plane diffraction grating method
4. Diffraction due to single slit
5. Dispersive power of a diffraction grating

6. Magnetic field along the axis of a circular coil carrying current

7. Determine the self-inductance of the coil (L) using Anderson's bridge

8. Study the variation of B versus H by magnetizing the magnetic material (B-H curve)

9. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle

10. To determine the resistivity of semiconductor by Four probe method

11. To determine the energy gap of a semiconductor

12. Measurement of resistance with varying temperature

13. Determination of dielectric constant by charging and discharging method.

14. LASER: Determination of wavelength of laser source by using diffraction grating

15. LASER: Determination of Particle size (hair) by using laser source

4. Laboratory Equipment/Software/Tools Required

1. Spectrometer
2. Travelling Microscope
3. Stewart-Gee's Apparatus
4. Single slit
5. Anderson's Bridge
6. B-H Curve
7. Optical Fiber Kit
8. Four Probe kit
9. Energy gap kit
10. Thermistor

5. Books and Materials

Text Book(s):

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

Reference Book(s)

https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=802&cnt=1.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30502 – PYTHON PROGRAMMING LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	30	70	100

1. Course Description

Course Overview

This lab helps the students gaining the knowledge to write python language applications, mathematical and engineering problems. Helps the students to apply python programming libraries in solving the computational problems.

Course Pre/Co-requisites

A30501 – Python Programming

2. Course Outcomes (COs)

After completion of the course, the learner will be able to:

A30502.1 Design solutions to mathematical problems & Organize the data for solving the Problem.

A30502.2 Understand and implement modular approach using python

A30502.3 Learn and implement various data structures provided by python library including string, list, dictionary and its operations etc.

A30502.4 Understands about files and its applications.

A30502.5 Develop real-world applications, files and exception handling provided by python

A30502.6 Select appropriate programming construct for solving the problem

3. Course Syllabus

Experiment-1 a) Running instructions in Interactive interpreter and a Python Script.
b) Write a program to compute distance between two points taking input from the user

Experiment-2 a) Write a Program for checking whether the given number is a even number or not.
b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . ,1/10

Experiment-3 a) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
b) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Experiment-4 a) Write a Python program to check if a number is a perfect number.
b) Write a Python program to check if a number is a strong number.

Experiment-5 a) Write a program to count the number of characters in the string and store them

in a dictionary data structure.
b) Python program to split a string based on a delimiter and join the string using another delimiter.

Experiment-6 a) Python Program to Convert Decimal to Binary, Octal and Hexadecimal without using built in methods.
b) Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.

Experiment-7 a) Write a function dups to find all duplicates in the list.
b) Write a function cumulative product to compute cumulative product of a list of numbers.

Experiment-8 a) Write a function reverse to reverse a list. Without using the reverse function.
b) Write function to compute gcd, lcm of two numbers using recursion.

Experiment-9 a) Write a program to perform addition of two square matrices.
b) Write a program to perform multiplication of two square matrices.

Experiment-10 a) Write a program to print each line of a file in reverse order.
b) Write a program to compute the number of characters, words and lines in a file.

4. Laboratory Equipment/Software/Tools Required

Open source scripting language (Spyder, pyscripter and etc), Python IDLE, Anaconda

5. Books and Materials

Text Book(s)

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd edition, O'Reilly, 2016.
Or
http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
2. Algorithmic Problem Solving with Python, John B. Schneider ,Shira Lynn Broschat, Jess Dahmen.
3. Think in Python, Allen Downey, Green Tea Press, Needham, Massachusetts.

Reference Book(s)

1) Paul Barry, "Head First Python a Brain Friendly Guide" 2nd Edition, O'Reilly, 2016.
2) DainelY.Chen "Pandas for Everyone Python Data Analysis" Pearson Education, 2019.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30010 – MATHEMATICS – II

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course offers more advanced topics of mathematics required to analyze the problems in engineering. Topics to be covered in this course include: Linear Differential Equations of Higher Order, Equations Reducible to Linear Differential Equations and Applications, Partial Differential Equations – First order, Multi variable Calculus (Vector differentiation & Integration). Mathematical skills derived from this course provides necessary base to analytical and theoretical concepts occurring in the program.

Course Pre/co requisites

- Calculus
- Vectors

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A30010.1	Apply the mathematical principles to solve second and higher order differential equations.
A30010.2	Analyze the non- homogeneous linear differential equations along with method of variation of parameters.
A30010.3	Apply the concept of higher order differential equations to the various streams like Mass spring system and L-C-R Circuit problems.
A30010.4	Apply a range of techniques to find solutions of standard PDEs and basic properties of standard PDEs.
A30010.5	Analyze the vector calculus involving divergence, curl and their properties along with vector identities.
A30010.6	Apply Green's, Stokes and Divergence theorem in evaluation of double and triple integrals.

3. Course Syllabus

UNIT-I: Differential Equations of First and Higher Order

Formation of differential equations, solutions to First order differential equations(Exact &Reducible to Exact),Higher order linear differential equations , complete solution, operator D, Solution of homogeneous &Non-Homogeneous linear differential equations, method of variation of parameters.

UNIT-II:Equations Reducible to Linear Differential Equations and Applications

Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients, Applications: Mass spring system and L-C-R Circuit problems.

UNIT-III: Partial Differential Equations – First order

Formation of PDE by the elimination of arbitrary constants and arbitrary functions. solutions of first order linear and non-linear Partial differential equations (f(p,q) = 0,f(z,p,q) = 0,f(x,p) = F(y,q) ,Z = px +qy+f(x,y) ,f(x,y,z,p,q) = 0(Charpit's method)). Solutions of homogeneous higher order linear partial differential equations with constant coefficients.

UNIT-IV: Vector differentiation

Scalar and vector point functions, vector differential operator(DEL) Gradient,Directional derivatives,normal to surface, Divergence,Solenoidal vector and Curl, Irrational vector,vector identities.

UNIT-V: Vector integration

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof).Problems related to Green's, Stokes,Divergence theorems.

4. Books and Materials

Textbooks:

1. Erwin Kreyszig, *Advanced Engineering Mathematics,* 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, *Higher Engineering Mathematics*, 44/e, Khanna publishers, 2017.

References:

1. R. K. Jain and S. R. K. Iyengar, *Advanced Engineering Mathematics*, 3/e, Alpha Science International Ltd., 2002.
2. George B. Thomas, Maurice D. Weir and Joel Hass, *Thomas Calculus,* 13/e, Pearson Publishers, 2013.
3. Glyn James, *Advanced Modern Engineering Mathematics*, 4/e, Pearson publishers, 2011.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30005 – CHEMISTRY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course acquaints the students with different softening methods and develops the study of electrochemical cells, types of batteries and their applications, Interactions between them, emphasizing their properties and indicating some applications. It deals with more advanced topics, familiarises engineering material, their properties and applications which provides the student to impart knowledge on corrosion and its significance, to explain nano and Smart materials and their uses.

Course Pre/Co requisites

Bridge Course

2. Course Outcomes (COs)

After the completion of the course, the student will be able to

A30005.1 To illustrate the molecular orbital energy levels for different molecular species and Apply Schrodinger wave equation and particle in a box.

A30005.2 To differentiate between pH metry, Potentiometric and conductometric titrations.

A30005.3 Explain the preparation properties and applications of polymers and describe the mechanism of conduction in conducting polymers.

A30005.4 Understand the principles of different analytical instruments and explain their applications.

A30005.5 Explain the concept of nano clusters nano wires and characterize the applications of SEM & TEM.

A30005.6 Explain of different types of colloids, their preparations, properties and applications

3. Course Syllabus

Unit – 1 : Structure and Bonding Models: Planck's quantum theory, dual nature of matter, Schrodinger equation, significance of Ψ and Ψ^2 , applications to hydrogen, Particle in a box model , molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O_2 and CO, etc. calculation of bond order, crystal field theory – salient features – energy level diagrams for transition metal ions – splitting in octahedral and tetrahedral environments-Applications of CFT (magnetic properties and colour).

Unit- 2: Electrochemistry and Applications: Electrodes – concepts, reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode) electrochemical cell, Nernst equation, cell potential calculations, numerical problems. Photovoltaic cell &photo galvanic cells – working and applications. Primary cells – Zinc-air battery, alkali metal sulphide batteries, Secondary cells – lead acid and lithium batteries. Fuel cells - Hydrogen-oxygen & Methanol fuel cells – working and applications.

Unit - 3: Polymer Chemistry: Introduction to polymers, Basic Concepts, Chain growth and Step growth polymerization, copolymerization (stereo specific polymerization) with specific examples. Mechanisms of polymer formation. Plastomers: Thermoplastics and Thermosetting, Preparation, properties and applications of – Bakelite, Nylons. Elastomers: Buna-S, Buna-N–preparation, properties and applications. Conducting polymers – polyacetylene, polyaniline – mechanism of conduction and applications.

Unit – 4: Instrumental Methods and Applications: Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. Principle and applications of pH metry, potentiometer, Conductometry, UV- spectroscopy, IR Spectroscopy. Chromatography- Basic principle- TLC- Separation of organic mixtures

Unit – 5: Nano materials and Colloidal chemistry:
Nano materials : Introduction to nano materials: Nano particles, nano clusters, (CNT's) and nano wires. Chemical synthesis of nano materials- Sol gel method. Characterization: principle and application of scanning electron microscope (SEM) and Transmission Electron Microscope (TEM).
Colloidal chemistry: Introduction to colloidal chemistry - colloidal, Micelle formation, synthesis of colloids (any two methods with examples), properties and applications.

4. Books and Materials

Text Books:

1. Jain and Jain, *Engineering Chemistry,* 16/e, Dhanpat Rai,2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' *Physical Chemistry,* 10/e, Oxford University Press,2010.
3. K N Jayaveera, G V Subba Reddy and C Rama Chandraiah, *Engineering Chemistry* 1/e Mc Graw Hill Education (India) Pvt Ltd, New Delhi 2016
4. B.K Sharma *Engineering Chemistry,* Krishna Prakashan, Meerut.

Reference Books:

1. J. D. Lee, *Concise Inorganic Chemistry,* 5/e, Oxford University Press,2008.
2. Skoog and West, *Principles of Instrumental Analysis,* 6/e, Thomson,2007.
3. Ben L. Feringa and Wesley R. Browne, *Molecular Switches,* 2/e, Wiley-VCH,2011.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30503 – DATA STRUCTURES USING C

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course covers data structures and algorithms.Topics include space and time complexity, analysis, static data and dynamic data structures. The learner will enrich their logical abilities by handling data in organised way. The students can choose their career path as software engineers.

Course Pre/Corequisites

- C
- Mathematics

2. Course Outcomes (COs)

After completion of the course, the learner will be able to:

A30503.1	Learn to choose appropriate data structure as applied to specified problem definition.
A30503.2	Design and analyse linear and non-linear data structures.
A30503.3	Design algorithms for manipulating linked lists, stacks, queues, trees and graphs.
A30503.4	Demonstrate advantages and disadvantages of specific algorithms and data Structures.
A30503.5	Develop programs for efficient data organisation with reduce time complexity.
A30503.6	Evaluate algorithms and data structures in terms of time and memory complexity of basic operations.

3. Course Syllabus

Unit-1
Introduction to Problem Solving Using C
Introduction: Structure of C Program, Identifiers, Basic data types, Variables, Constants, I/O functions , Operators, Selection Statements – if and switch statements, Repetition statements – while, for, do-while statements, other statements related to looping – *break, continue,goto*,Arrays-Operations
Unit-2
Solving Problems using arrays, Functions, Strings, Pointers.
Linear Data Structures
Stacks: Introduction-Definition-Representation of Stack-Operations on Stacks- Applications of Stacks.

Unit-3
Queues: Introduction, Definition- Representations of Queues- Various Queue Structures-Applications of Queues.
Unit-4
Linked lists:

Definition- Single linked list- Circular linked list- Double linked list- Circular Double linked list.
Sorting: Bubble Sort, Selection Sort, Insertion Sort, Shell Sort, Merge Sort, Quick Sort
Unit-5
Search: Sequential Search, Binary Search, Hashing, time complexity.
Trees and Graphs:
Trees: examples, Binary Trees, Tree Traversals, Binary Search Trees.
Graph: BFS and DFS.

4. Books and Materials

Text Book(s)

1. C & Data Structures, by farouzan
2. Fundamentals of Data Structures in C – Horowitz, Sahni, Anderson- Freed, Universities Press, Second Edition.

.

Reference Book(s)

1.B.W. Kernignan and Dennis M.Ritchie, The C Programming Language, (PHI), 2nd Edition 2003.

2.Jean Paul Tremblay and Paul G.Sorenson[2007], An Introduction to DataStructures With Applications, TMH

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A33101 –FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

AI provides an overview of AI concepts and workflows, machine learning, deep learning, and performance metrics. You'll learn the difference between supervised, unsupervised, and reinforcement learning; be exposed to use cases, and see how clustering and classification algorithms help identify AI business applications.

Course Pre/Co-requisites

- Mathematics -1
- Computer Programming
- Problem Solving and Algorithms
- Probability and Statistics

2. Course Outcomes (COs)

After completion of the course, the learner will be able to:

A33101.1	An ability to analyze a problem, identify and define the computing requirements appropriate to its solution.
A33101.2	An ability to design, implement and evaluate a system / computer based system process, component or program to meet desired needs
A33101.3	An ability to identify, formulate and solve engineering problems using the concepts of Artificial Intelligence.
A33101.4	Design and conduct experiments as well as analyze and interpret data using Machine Learning Algorithms
A33101.5	An ability to use current techniques and skills necessary for computing and engineering practice
A33101.6	Get familiarized with the tools mandatory for handling problem solving techniques

3. Course Syllabus

Unit 1:

Introduction to Artificial Intelligence and Machine Learning. Linear Regression, Logistic Regression. Euclidean Distance metric and Mahalanobis distance metric, Eigen values, Eigen matrices, Variance, Covariance matrix, Singular Value Decomposition, Principal Component Analysis and problems.

Unit 2:

Classification Problem, Naïve Bayesian Classifier, Support Vector Machines, Clustering Problem, Similarity measures, K-Means Algorithm, DBSCAN Algorithm.

Unit 3:

Knowledge representation issues – Predicate logic – logic programming – Sematic nets, Frames and inheritance, constraint propagation –Representing Knowledge using rules – Rules based deduction system.

Unit 4:

Introduction- Foundation and history of AI, AI Problems and techniques, Problem spaces and searches, Blind search strategies; Breadth first, Depth first – Heuristic search techniques Hill climbing, Best first – A* algorithm AO* algorithm.

Unit 5:

Fuzzy Logic, Fuzzy Sets, Fuzzy Classification. Equivalence Relation and Equivalence Classes, Rough Sets and Classification using Rough Sets. Introduction to Genetic Algorithms.

4. Books and Materials

Text Book(s)

1. The Elements of Statistical Learing – Trevor Hastie, Robert Tibshirani and Jerome Friedman, Second Edition, Springer
2. Rich and Knight – Artificial Intelligence

Reference Book(s)

1. Prateek, J.: Artificial Intelligence with Python, pp. 14–16. Packt Publishing, Birmingham (2017).
2. Husain, Amir. The sentient machine: The coming age of artificial intelligence. Simon and Schuster, 2017.
3. Kaplan, Jerry. Artificial intelligence: What everyone needs to know. Oxford University Press, 2016.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30302 – ENGINEERING WORKSHOP

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	3	30	70	100

1. Course Description

Course Overview

This course introduces students to the basic concepts related to Engineering workshop and also imparts the knowledge about usage of the tools. This course familiarizes students with woodworking, welding, sheet metal operations, fitting and electrical house wiring skills. This knowledge enables the students to fabricate, manufacture or work with materials.

Course Pre/co-requisites

This course has no Pre/co-requisites

2. Course Outcomes (COs)

After completion of the course, the learner will be able to:

A30302.1 Apply wood working skills to make products.

A30302.2 Perform metal cutting operations in the fitting section to make models.

A30302.3 Perform simple welding operations to join to metal pieces.

A30302.4 Apply sheet metal working skills to make required models.

A30302.5 Evaluate the performance analysis of various pumps and turbines.

A30302.6 Perform general maintenance works on own at house/ work place.

3. Course Syllabus

1. **FittingTrade–**Making ofaL-fitfromthegivenM.SFlatmaterialpiece.
2. **FittingTrade–**Making ofaSquare jointfromthegivenM.SFlatmaterialpiece.
3. **CarpentryTrade–**Making of acrosslapjointasperspecification.
4. **CarpentryTrade**-Tomakeadovetailjointasperspecification.
5. **TinSmithy**–Making ofanopenscoopwiththegivensheetmetal
6. **TinSmithy**–Making ofasquare tinwiththegivensheetmetal
7. **Foundry:**Preparation ofasandmouldusingasinglepiecepattern

8. **Welding**: Preparation of a single V butt joint
9. **Welding**: Preparation of single lap joint
10. **House Wiring:** One bulb connected by oneone-way switch
11. **House Wiring:** One bulb connected by twoTwo- way switches
12. **House Wiring:** Staircasewiring
13. **House Wiring:**Tubelightwiring
15. **House Wiring:** Go-DownWiring

4. Laboratory Equipment/Software/Tools Required

1. Fitting bench wise
2. Hack saw frame
3. Carpentry benchwise
4. Jack plane
5. Snip tool
6. Nose player
7. Cope & Drag
8. Sprue
9. Welding machine
10. House wiring set up

5. Books and Materials

Text Book(s)

P.N. Rao, *Manufacturing Technology*, Volume-I, Tata McGraw Hill, 4th edition, 2013.

Reference Book(s)

1. Schmid and Kalpakjin, *Manufacturing Technology*, Pearson education, 7thedition, 2014.

2. P. N. Rao, *Manufacturing Technology*, *Foundry forming and welding*, Volume-I, McGraw Hill education, 5th edition, 2018.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30009 – CHEMISTRY LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	30	70	100

1. Course Description

Course Overview

- This course introduces the basic concepts of practical understanding of the redox reactions which is the foundation for the Engineering discipline.
- The emphasis of this course is laid on the preparation and properties of synthetic polymers and other material that would provide sufficient impetus to engineers theseto suit diverse applications.
- Learn practical understanding of Potentiometric titrations

Course Pre/co requisites:

A30005- Chemistry

2. Course Outcomes (COs)

After completion of the course, the learner will be able to:

A30009.1	Understand the determine the cell constant and conductance of solutions
A30009.2	Prepare advanced polymer materials.
A30009.3	Measure the strength of an acid present in secondary batteries
A30009.4	Understand and apply the pH metric titrations.
A30009.5	Verify Lambert-Beer'slaw
A30009.6	Potentiometry - determination of redox potentials and EMFs

3. Course Syllabus

1. Determination of cell constant and conductance of solutions
2. Conduct metric titrations of Strong acid Vs Strong base
3. pH metric titration of weak acid vs. strong base
4. Potentiometry - determination of redox potentials and EMFs
5. Estimation of Ferrous Iron by Dichometry
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a polymer (Bakelite)
8. Verify Lambert-Beer's law
9. Determination of copper by colorimetry
10. Thin layer chromatography
11. Identification of simple organic compounds by UV-Visible Spectral analysis
12. Preparation of nanomaterials by Precipitation method.

4. Laboratory Requirements

1. Conductivity meter
2. p^H meter
3. Potentiometer
4. Colorimeter
5. TLC chamber
6. UV- Spectrometer

5. Books and Materials **Reference Book(s):**

1. Mendham J, Denney RC, Barnes JD, Thosmas M and Sivasankar B Vogel's *Quantitative Chemical Analysis* 6/e, Pearson publishers (2000).

2. N.K Bhasin and Sudha Rani *Laboratory Manual on Engineering Chemistry* 3/e, Dhanpat Rai Publishing Company (2007).

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30504 – DATA STRUCTURES LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	30	70	100

1. Course Description

Course Overview

This Laboratory covers data structures and algorithms. Programs include static data and dynamic data structures along with analysis of time and space complexity. The learner will enrich their logical abilities by handling data in an organised way. The students can choose their career path as software engineers.

Course Pre/Corequisites

A30503- Data Structures Using C

2. Course Outcomes (COs)

After completion of the course, the learner will be able to:

Learn to choose appropriate data structure as applied to specified problem definition.

After completion of the course, the learner will be able to:

A30504.1	Learn to choose appropriate data structure as applied to specified problem definition.
A30504.2	Design and analyse linear and non-linear data structures.
A30504.3	Design algorithms for manipulating linked lists, stacks, queues, trees and graphs.
A30504.4	Demonstrate advantages and disadvantages of specific algorithms and data Structures.
A30504.5	Develop programs for efficient data organisation with reduce time complexity.
A30504.6	Evaluate algorithms and data structures in terms of time and memory complexity of basic operations.

3. Course Syllabus

PART A: Introduction

Task – 1	Write a program to sort the number of elements using sorting by exchange. Write a program to sort the characters in a string using sorting by exchange.
Task – 2	Write a program to sort numbers using insertion sort. Write a program to sort the elements of an array using Selection Sort.
Task – 3	Write a program to convert infix expression to postfix expression and evaluate postfix expression.

Linked List, Stack, Queue

Task – 4	Write a program to implement stack, queue, circular queue using arrays and linked lists on employee details.
Task– 5	Write a program to perform the operations creation, insertion, deletion, and traversing a singly linked list
Task– 6	Write a program to perform the operations creation, insertion, deletion, and traversing a Doubly linked list.
Task– 7	Write a program to remove duplicates from ordered and unordered arrays.
Task– 8	Write a program to implement quick sort using non-recursive and recursive approaches.
Task– 9	Write a program to perform operations creation, insertion, deletion and traversing on a binary search tree.
Task– 10	Write a program to implement depth first search and breadth first search on graphs.

4. Laboratory Equipment/Software/Tools Required

C Compiler, GCC, Dev C++, Turbo C Editor

5. Books and Materials

Text Book(s)

1. Herbert Schildt. *The Complete Reference C*. Fourth Edition, Mc-GrawHillEduction, 2008.
2. DebasisSamanta. *Classic Data Structures*. Second Edition, PHI,2009.

Reference Book(s)

1. Horowitz, Sahni, Anderson Freed. Fundamentals of Data Structures in C.2nd Edition, Universities Press.
2. Ron S.Gottfried, Programming with C, 3rd Edition, TMH, 2011.
3. G A VijayalakshmiPai. *Data Structures and Algorithms*. TMH, 2008.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A33102 - BASIC ARTIFICIAL INTELLIGENCE LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	30	70	100

1. Course Description

Course Overview

The aim of this Laboratory is to create computer programs that can solve problems by learning experiences. This course covers binarization, normalization data pre processing technique to apply on sample data. From this course, the student acquires fundamental knowledge on AI techniques to solve general purpose problems. This course helps the students to choose their career path in trending Artificial Intelligence related technologies.

Course Pre/Co-requisites

Mathematics -1
Computer Programming
Problem Solving and Algorithms
Probability and Statistics
Artificial Intelligence

2. Course Outcomes (COs)

After completion of the course, the learner will be able to:

A33102.1	Execute statistical problems to produce appropriate solutions
A33102.2	Categorize the problem for selection of an appropriate algorithm
A33102.3	Compare computational complexity of AI problems for better efficiency
A33102.4	Demonstrate various AI algorithms based on empirical and theoretical proofs for performance statistics
A33102.5	An ability to use current techniques and skills necessary for computing and engineering practice
A33102.6	Get familiarized with the tools mandatory for handling problem solving techniques

3. Course Syllabus

1. Apply Binarization data pre processing technique on sample data.
2. Apply Mean Removal data pr eprocessing technique on sample data.
3. Apply Min and Max scaling on sample data.
4. Apply normalization data pre processing technique on real estate data.
5. How to encode the labels and show the performance of encode dlabels.
6. Using Pandas perform the following
    a. Handling.
    b. Slicing.
    c. Extracting statistics from Time Series Data.
7. Use the sklearn.svm package and implement classification.
8. Using python program build a Linear Regressor.

4. Laboratory Equipment/Software/Tools Required

Open source scripting language, Python IDLE, Anaconda

5. Books and Materials

Text Book(s)

1. S. Russel and P. Norvig, *Artificial Intelligence – A Modern Approach*, 4th edition, Pearson Education,2020.

Reference Book(s)

1. Elain Rich and Kevin Knight, *Intelligence*, 3rd edition, TMH, 2017.
2. David Poole, Alan Mackworth, Randy Goebel, *Computational Intelligence: a logical approach*, Oxford University Press, 2012.

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

A30032-UNIVERSAL HUMAN VALUES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	28	0	0	3	100		100

1. Course Description

Course Overview:

This course is aimed at giving inputs that will help to ensure the right understanding and right feelings in the students in their life and profession, enabling them to lead an ethical life. In this course, the students learn the process of self-exploration, the difference between the Self and the Body, the naturally acceptable feelings in relationships in a family, the comprehensive human goal in the society, the mutual fulfillment in the nature and the co-existence in existence. As a natural outcome of such inputs, they are able to evaluate an ethical life and profession ahead.

Course Pre/Co-requisites:

The course has no specific pre/co-requisites

Course Outcomes (COs)

After the completion of the course, the student will be able to:

A30032.1 Understand the significance of value inputs in a classroom and start applying them in their life and profession

A30032.2 Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.

A30032.3 Understand the value of harmonious relationship based on trust and respect in their life and profession

A30032.4 Understand the role of a human being in ensuring harmony in society and nature.

A30032.5 Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

A30032.6 Analyze the value of maintaining ethical values in critical situations

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL (AUTONOMOUS)

Course Syllabus

UNIT – I

Course Introduction - Need, Basic Guidelines, Content and Process for ValueEducation

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self Exploration–what is it? - its content and process; 'Natural Acceptance'and Experiential Validation- as the mechanism for self exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels

UNIT –II

Understanding Harmony in the Human Being - Harmony in Myself

Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and
enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I',
Understanding the harmony of I with the Body: Sanyam and Swasthya; correctappraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya

UNIT –III

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

Understanding harmony in the Family- the basic unit of human interaction, Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*;Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship, Understanding the meaning of *Vishwas*; Difference between intention and competence, Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva* as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha*)- from family to world family!

UNIT –IV

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence

UNIT – V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics:

a) Ability to utilize the professional competence for augmenting universal human order,b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models

Case studies of typical holistic technologies, management models and production, systems, Strategy for transition from the present state to Universal Human Order:

a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b) At the level of society: as mutually enriching institutions and organizations

4. Books and Materials

Text Book:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

Reference Books:

1. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
2. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
3. A N Tripathy, 2003, Human Values, New Age International Publishers.
4. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
5. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books

PROGRAMME CURRICULUM STRUCTURE UNDER R20 REGULATIONS

B. TECH – COMPUTER SCIENCE ANDENGINEERING - ARTIFICIAL INTELLIGENCE (CAI)

III SEMESTER (II YEAR)

Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A30019	Managerial Economics & Financial Analysis	HS	3	0	0	3	40	60	100
A30507	Database Management Systems	PC	3	0	0	3	40	60	100
A30516	Design and Analysis of Algorithms	PC	3	0	0	3	40	60	100
A30421	Digital Electronics	ES	3	0	0	3	40	60	100
A30018	Numerical Methods	BS	3	0	0	3	40	60	100
A30509	Database Management Systems Laboratory	PC	0	0	3	1.5	40	60	100
A30422	Digital Electronic Laboratory	PC	0	0	3	1.5	40	60	100
A30516	Design and Analysis of Algorithms Laboratory	PC	0	0	3	1.5	40	60	100
A33114	Web Application Development	SC	1	0	2	2	40	60	100
A30031	Environmental Science	MC	2	0	0	0	100*	0	100*
	TOTAL		18	0	11	21.5	360	540	900

* The marks for Mandatory Courses are not considered for calculating SGPA

IV SEMESTER (II YEAR)

Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A33106	Data Science	PC	3	0	0	3	40	60	100
A30506	Object Oriented Programming through Java	PC	3	0	0	3	40	60	100
A30516	Discrete Mathematics	BS	3	0	0	3	40	60	100
A30513	Operating Systems	PC	3	0	0	3	40	60	100
A30514	Software Engineering	PC	3	0	0	3	40	60	100
A33107	Data Science Laboratory	PC	0	0	3	1.5	40	60	100
A30508	Object Oriented programming through Java Laboratory	PC	0	0	3	1.5	40	60	100
A30517	Operating System Laboratory	PC	0	0	3	1.5	40	60	100
A33108	Unix & Shell Programming	SC	1	0	2	2	40	60	100
TOTAL			16	00	11	21.5	360	540	900
Internship 2 Months (Mandatory) during summer vacation									
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)			4	0	0	4	40	60	100

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

R20-COURSE STRUCTURE

III – SEMESTER

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

PROGRAMME CURRICULUM STRUCTURE UNDER R20 REGULATIONS

B. TECH – COMPUTER SCIENCE ANDENGINEERING - DATA SCIENCE (CSD)

III SEMESTER (II YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A30019	Managerial Economics & Financial Analysis	HS	3	0	0	3	40	60	100
A30507	Database Management Systems	PC	3	0	0	3	40	60	100
A30516	Design and Analysis of Algorithms	PC	3	0	0	3	40	60	100
A30421	Digital Electronics	ES	3	0	0	3	40	60	100
A30018	Numerical Methods	BS	3	0	0	3	40	60	100
A30509	Database Management Systems Laboratory	PC	0	0	3	1.5	40	60	100
A30422	Digital Electronic Laboratory	PC	0	0	3	1.5	40	60	100
A30516	Design and Analysis of Algorithms Laboratory	PC	0	0	3	1.5	40	60	100
	Web Application Development	SC	1	0	2	2	40	60	100
A30031	Environmental Science	MC	2	0	0	0	100*	0	100*
	TOTAL		18	0	11	21.5	360	540	900

* The marks for Mandatory Courses are not considered for calculating SGPA

COURSE STRUCTURE

A30019 – MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	40	60	100

1. Course Description

Course Overview

This course is designed in such a way that it gives an overview of concepts of managerial economics financial analysis. Managerial economics enables students to understand micro environment in which markets operate how price determination is done under different kinds of competitions. Financial analysis gives clear idea about concepts and conversions accounting procedures along with introducing students to fundamentals of ratio analysis and interpretation of financial statements.

Course Pre/corequisites

The course has no specific prerequisite and corequisite

2. Course Outcomes (COs)

After completion of the course, the student will be able to:

A30019.1 Analyze the concepts of managerial economics and financial accounting to make better decisions in the organization

A30019.2 Analyze the demand, production, cost and break even to know interrelationship among variables and their impact

A30019.3 Classify the market structure to decide the fixation of suitable price

A30019.4 Apply capital budgeting techniques to select best investment opportunity

A30019.5 Analyze and prepare financial statements to assess financial health of business.

3. Course Syllabus

UNIT I

Managerial Economics: Definition, Nature and Scope of Managerial Economics, Relation with other disciplines –Demand Analysis: Types, Determinants, Laws, GST-Implications. Elasticity of Demand: Types, Measurement and Significance, methods of demand Forecasting.

UNIT II

Production function: Isoquants and Iso-costs, MRTS, Least Cost Combination of Inputs. Laws of Production. Cost & Break-Even Analysis: Cost concepts, Break-even Analysis (BEA)-Determination.

UNIT III

Market structures: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition, oligopoly.Pricing: Objectives, Policies, Methods, Cross Subsidization

UNIT IV

Capital: significance, Types, Components, Factors, Methods and sources of raising finance. Capital Budgeting: Nature and scope, features, Methods - Payback Method, Accounting Rate of Return (ARR), Net Present Value, Profitability Index, Internal rate of return.

UNIT V

Accounting Principles: Concepts, Conventions, Double Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts with simple adjustments. Financial Analysis through Ratios: Importance, types- Liquidity Ratios, Activity Ratios, Turnover Ratios and Profitability ratios.

4. Books and Materials

Text Book(s)

1. A.R. Aryasri, *Managerial Economics and Financial Analysis*, TMH, India, 2011.

Reference Book(s)

1. Varshney &Maheswari, *Managerial Economics*, Sultan Chand, 2003.
2. Ambrish Gupta, *Financial Accounting for Management: An Analytical Perspective*, 4th Edition, Pearson Education, New Delhi, 2011.

COURSE STRUCTURE

A30507– DATABASE MANAGEMENT SYSTEMS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	40	60	100

1. Course Description

Course Overview

This course enlightens the learners with the comprehensive concepts of database and its applications. It covers various data models, Entity Relationship diagrams, SQL queries, transactions and indexing techniques. The learners of this course can choose the domain of Data Engineering and can opt their carrier path in database administration or data analytics.

Course Pre/corequisites

The course has no specific prerequisite and co-requisites.

2. Course Outcomes (COs)

After completion of the course, the learner will be able to:

A30507.1 Apply suitable data model for given application

A30507.2 Construct optimized SQL queries to solve real time problems

A30507.3 Apply suitable normal form to eliminate data redundancy

A30507.4 Use suitable transaction model to avoid Deadlock

A30507.5 Choose appropriate index structure to improve performance

3. Course Syllabus

UNIT I

Introduction-Basics of Database System and its Applications, Database System Principles. Data View - Data Abstraction, Instances and Schemas, Data Models, Database Languages, Database Architecture, Database Users and Administrators, Introduction to Database design

UNIT II

ER diagrams- Entities, Attributes and Entity sets, Relationship sets, Additional features of ER Model, Conceptual Design with ER Model. Relational Algebra - Selection and Projection, Set operations, Renaming, Joins, Division, Examples of Algebra Queries

UNIT III

Basic SQL Queries - Examples of Basic SQL Queries, Introduction to Sub queries, Correlated Sub queries, Set - Comparison Operators, Aggregate Operators, NULL values - Comparison using Null values, AND, OR and NOT - Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Data bases. Schema Refinement - Redundancy Issues, Decompositions - Examples related to decompositions, Functional Dependencies

UNIT IV

Normal Forms - FIRST, SECOND, THIRD Normal forms – BCNF, FOURTH Normal Form, FIFTH Normal form. Transaction Concept - Transaction State, ACID Properties, Concurrency control, Serializability and Recoverability. Concurrency Control - Lock Based Protocols, Timestamp Based Protocols, Validation Based Protocols.

UNIT V

Data on External Storage - File Organization and Indexing - Clustered Indexes, Primary and Secondary Indexes, Index data Structures - Hash Based Indexing, Tree based Indexing Comparison of File Organizations. Tree Structured Indexing-Indexed Sequential Access Methods(ISAM) , B+ Trees: A Dynamic Index Structure and its operations. Hash Based Indexing - Static Hashing, Extendable hashing, Linear Hashing.

4. Books and Materials

Text Book(s)

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, McGrawHill Education, 3rd edition, 2017.

Reference Book(s)

1. Database Systems, 6th edition Korth Tata Mc Grawhill 2017.

COURSE STRUCTURE

A30516 – DESIGN AND ANALYSIS OF ALGORITHMS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	40	60	100

1. Course Description

Course Overview

This course enables the learner to identify complexity of a given algorithm and techniques. It covers various algorithm design techniques, basic computability concepts and the complexity classes P, NP, NP-Complete are introduced for solving hard problems. The learners of the course can tackle the complex algorithmic problems with great ease in real world situations.

Course Pre/corequisites

1. A30503- Data Structures

2. Course Outcomes (COs)

After completion of the course, the learner will be able to:

A30516.1 Analyze the efficiency of algorithm for a given problem.

A30516.2 Formulate the time order analysis for given algorithm.

A30516.3 Identify the mathematical techniques required to prove the time complexity of an algorithm.

A30516.4 Design appropriate algorithm to solve real world problems.

A30516.5 Develop an application with the designed algorithms.

3. Course Syllabus

UNIT-I

Introduction: Algorithm, specifications of algorithm, algorithm measurement divide and conquer: general method, binary search, finding the maximum and minimum, merge sort, quick sort, selection sort, stressen's matrix multiplication

UNIT-II

Greedy Method & Dynamic Programming: General method, knapsack problem, job scheduling with deadlines, minimum cost spanning trees, optimal storage on tapes, single-source shortest paths. Dynamic programming: General method, multistage graphs, all-pairs shortest paths, 0/1 knapsack, the travelling sales person problem.

UNIT-III

Basic Traversal and Search Techniques & Back tracking: Basic traversal and search techniques: traversal techniques for binary trees, traversal techniques for graphs, connected components and spanning trees, bi-connected components Back tracking: Common method, 8 – queens problem, sum of subsets problem, graph coloring and Hamiltonian cycles.

UNIT-IV

Branch and Bound & Lower Bound Theory: Branch and Bound: The method, travelling salesperson, 0/1 knapsack problem lower bound theory: comparison trees, lower bounds through reductions – multiplying triangular matrices, inverting a lower triangular matrix, computing the transitive closure.

UNIT-V

NP – Hard and NP – Complete Problems: NP hardness, NP completeness, consequences of being in P, cook„s theorem, halting problem, non-deterministic problem, clique‟s, SAT problem.

4. Books and Materials

Text Book(s)

1. Ellis Horowitz, S. Satraj Sahani and Rajasekhran, *Fundamentals of Computer Algorithms*, 2nd Edition, University Press.2014.

Reference Book(s)

1. Parag Himanshu Dave, Himanshu Bhalchandra Dave, Pearson Education, *Design and Analysis of Algorithms*, Pearson Education, 2nd Edition, 2009
2. T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein, *Introduction to Algorithms*, 2nd Edition, PHI Pvt. Ltd./ Pearson Education.

COURSE STRUCTURE

A30421 – DIGITAL ELECTRONICS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	40	60	100

1. Course Description

Course Overview

This course provides a introduction to logic design and the basic building blocks used in digital systems, in particular digital computers. It starts with a discussion of information representation and number systems, Boolean algebra, logic gates and minimization techniques. The second part of the course deals with combinational and sequential logic, where in the procedures to analyze and design the same will be discussed. This course will be useful to students as a basis for microprocessors and microcontrollers and embedded systems.

Course Pre/corequisites

The course has no specific prerequisite and corequisites.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

A30421.1 Perform arithmetic operations on different number systems and to apply the principles of Boolean algebra to minimize logic expressions.

A30421.2 Make use of k-map and tabulation methods to minimize Boolean functions and to implement with logic gates.

A30421.3 Analyse basic components used in digital systems such as adder and subtractor, decoder, encoder, multiplexer, flip-flops, registers and counters

A30421.4 Distinguish combinational and sequential logic in terms of their functions.

A30421.5 Design various PLDs such as ROMs, PALs, PLAs and PROMs.

3. Course Syllabus

UNIT-I

DIGITAL SYSTEMS AND BINARY NUMBERS: Review of number systems and their conversions, Representation of negative numbers, binarycodes, and Hamming code. Boolean algebra, Theorems and properties of Boolean algebra, canonical and standard forms of SOP/POS form, digital logic gates, Implementation of universal gates.

UNIT-II

GATE LEVEL MINIMIZATION: The k-map method, four-variable map, five-Variable map, Sum of Products and Product of Sums simplification, don't-care conditions, realization using universal gates, AND-OR-INVERT, OR-AND- INVERT models realization, exclusive-OR properties, The tabulation(QuineMccluskey) method, determination of Prime implicants and essential prime implicants.

UNIT-III

COMBINATIONAL LOGIC: Introduction, analysis and design with basic logic gates (code converters), comparators, data selectors, priority encoders, decoders, full adder, serial binary adder, parallel binary adders-ripple-carry adder, carry-look ahead adder, BCD adder, subtractor and binary multiplier.

UNIT-IV

SEQUENTIAL LOGIC: Memory elements and their excitation functions SR, JK, T, and D latches and flip-flops, master slaveJK flip-flop, analysis and design of clocked sequential circuits, state minimization and assignment. REGISTERS AND COUNTERS: Registers, classification of registers, Bidirectional shift register, design of ripple counters, synchronous counters, ring counter, twisted ring counter.

UNIT-V

MEMORY AND PROGRAMMABLE LOGIC: Types of memories, SRAM, DRAM, ROM, memory decoding, programmable logic array, programmable array logic, and Concept of Programmable logic devices like FPGA, Logic implementation using Programmable Devices.

4. Books and Materials

Text Book(s)

1) M. Morris Mano, Michael D. Ciletti, *Digital Design*, 4th edition, Pearson Education/PHI,India, 2008
2) Thomas L. Floyd 2006, *Digital fundamentals*, 9th edition, Pearson EducationInternational, 2006

Reference Book(s)

1) Zvi. Kohavi, *Switching and Finite Automata Theory*, Tata McGraw Hill, India, 2004
2) C.V.S. Rao, Switching and Logic Design, 3rd edition, Pearson Education, India, 2009

COURSE STRUCTURE

A30018- NUMERICAL METHODS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	40	60	100

1. Course Description

Course Overview

This course offers more advanced topics of mathematics required to analyze the problems in engineering. Topics to be covered in this course include: solutions of algebraic & transcendental equations, Interpolation, curve fitting, numerical solutions of differentiation, Integration, first order differential equations, solutions of first order differential equations. The mathematical skills developed through this course form a necessary base to analyze and design problems encountered in their engineering specialization.

Course Pre/corequisites

A2002- Mathematics-I

2. Course Outcomes (COs)

After completion of the course, the learner will be able to:

A30018.1 Apply numerical methods to solve algebraic and transcendental equations.

A30018.2 Derive interpolating polynomials using interpolation formulae.

A30018.3 Apply curve fitting techniques for data representations and computation in engineering analysis

A30018.4 Apply Ordinary Differential Equations to solve Engineering Problems.

A30018.5 Solve differential and integral equations numerically.

3. Course Syllabus

UNIT-I

Solutions of Algebraic and transcendental equations &Interpolation

Introduction-The Bisection method-The Method of False Position-Iteration Method -Newton-Raphson Method. Interpolation, Finite differences, Other difference operators and relations between them, Differences of a polynomial, Missing terms, Newton's interpolation formulae, Interpolation with unequal intervals: Lagrange's interpolation formula.

UNIT-II

Curve fitting : Method of least squares**,** Fitting a straight line, second degree parabola and other curves of the form $y = ae^{bx}$, $y = ab^{x}$, $y = ax^{b}$ by the method of least squares.

UNIT-III

Numerical Differentiation, Integration : Numerical differentiation: Derivatives using Newton's interpolation formulae. Numerical integration: Trapezoidal rule, Simpson's one-third rule, Simpson's three-eighth rule.

UNIT-IV

Ordinary Differential Equations of First Order

Exact, linear and Bernoulli equations, Applications of first order equations : orthogonal trajectories, Newton's law of cooling, Law of natural growth and decay.

UNIT-V

Numerical Solution of Ordinary Differential Equations of First Order

Taylor's series method, Picard's method, Euler's and modified Euler's Method, Runge-Kutta methods, Predictor and Corrector methods: Milne's method, Adams-Bashforth-Moulton method. Numerical solution of Laplace equations using finite difference approximation.

4. Books and Materials

Text Books:

1. B.S. Grewal, *Higher Engineering Mathematics*, 43rd edition, Khanna Publishers, New Delhi, 2014.
2. T.K.V.Iyengar, B.Krishna Gandhi, S.Ranganatham, M.V.S.S.N.Prasad, *Mathematical Methods* ,8th edition, S.Chand& Company Pvt.Ltd, 2013.

Reference Books:

1. B.V. Ramana, *Higher Engineering Mathematics*, 23rd Reprint, Tata Mc-Graw Hill Education Private Limited, New Delhi, 2015.
2. S.S.Sastry, *Introductory Methods of Numerical Analysis*, 5th edition, PHI learning private limited, 2012.

COURSE STRUCTURE

A30509– DATABASE MANAGEMENT SYSTEMS LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	40	60	100

1. Course Description

Course Overview

This Laboratory gives hands on experience of designing database and to access it. The learners will be practically able to apply ACID properties, indexing and querying concepts on database for efficient operations. The learners of this course can choose the domain of Data Engineering and can opt their carrier path in database administration or data analytics.

Course Pre/corequisites

A30507 Database Management Systems

2. Course Outcomes (COs)

After completion of the course, the learner will be able to:

A30509.1 Design Database tables for the given problem

A30509.2 Use appropriate querying processing technique to access the data

A30509.3 Apply suitable normal form to eliminate data redundancy

A30509.4 Develop PL/SQL routines for reusability of code

A30509.5 Apply appropriate triggering concepts for automation and performance

3. Course Syllabus

Course Content:

TASK-1	**CREATION OF TABLES:**	

Create a table called **Employee** with the following structure.

Name	Type
Empno	Number
Ename	Varchar2(20)
Job	Varchar2(20)
Doj	Number
Sal	Number

a. Add a column commission with domain to the Employee table.
b. Insert any five records into the table.
c. Update the column details of job

d. Rename the column of Employ table using alter command.
e. Delete the employee whose empno is19

TASK-2

Create **department** table with the followingstructure.

Name	Type
Deptno	Number
Deptname	Varchar2(20)
location	Varchar2(20)

a. Add column designation to the department table.
b. Insert values into the table.
c. List the records of emp table grouped by deptno.
d. Update the record where deptno is9.
e. Delete any column data from the table.

TASK-3

Create a table called **Customer**table

Name	Type
Cust name	Varchar2(20)
Cust street	Varchar2(20)
Cust city	Varchar2(20)

a. Insert records into the table.
b. Add salary column to the table.
c. Alter the table column domain.
d. Drop salary column of the customer table.
e. Delete the rows of customer table whose cust_city is‘kurnool’.

TASK-4

Create a table called **branch** table.

Name	Type
Branchname	Varchar2(20)
Branchcity	Varchar2(20) asserts
Branchname	Varchar2(20)

a. Increase the size of data type for asserts to the branch.
b. Add and drop a column to the branch table.
c. Insert values to the table.
d. Update the branch name column
e. Delete any two columns from the table

TASK-5

Create a table called **sailor** table

Name	Type
Sid Number	Sname Varchar2(20)
Rating Varchar2(20)	Varchar2(20)
Sid Number	Sname Varchar2(20)

a. Add column age to the sailor table.
b. Insert values into the sailor table.
c. Delete the row with rating >8.
d. Update the column details of sailor.
e. Insert null values into the table.

TASK-6

Create a table called **reserves**table

Name	Type
Boat id	Integer
Sid	Integer
Day	Integer

a. Insert values into the reserves table.
b. Add column time to the reserves table.
c. Alter the column day data type to date.
d. Drop the column time in the table.
e. Delete the row of the table with some condition.

TASK-7 **QUERIES USING DDL AND DML**

A college consists of number of employees working in different departments. In this context, create two tables **employee** and **department**. Employee consists of columns empno, empname, basic, hra, da, deductions, gross, net, date-of-birth. The calculation of hra,da are as per the rules of the college. Initially only empno, empname, basic have valid values. Other values are to be computed and updated later. Department contains deptno, deptname, and description columns. Deptno is the primary key in department table and referential integrity constraint exists between employee and department tables. Perform the following operations on the the database:

- Create tables department and employee with required constraints.
- Initially only the few columns (essential) are to be added. Add the remaining columns separately by using appropriate SQL command
- Basic column should not be null
- Add constraint that basic should not be less than 5000.
- Calculate hra,da,gross and net by using PL/SQL program.
- Whenever salary is updated and its value becomes less than 5000 a trigger has to be raised preventing the operation.

- The assertions are: hra should not be less than 10% of basic and da should not be less than 50% of basic.The percentage of hra and da are to be stored separately.
- When the da becomes more than 100%, a message has to be generated and with user permission da has to be merged with basic.
- Empno should be unique and has to be generated automatically.
- If the employee is going to retire in a particular month, automatically a message has to be generated.
- The default value for date-of-birth is 1 jan, 1970.
- When the employees called daily-wagers are to be added the constraint that salary should be greater than or equal to 5000 should be dropped.
- Display the information of the employees and departments with description of the fields.
- Display the average salary of all the departments.
- Display the average salary department wise.
- Display the maximum salary of each department and also all departments put together.
- Commit the changes whenever required and rollback if necessary.
- Use substitution variables to insert values repeatedly.
- Assume some of the employees have given wrong information about date-of-birth. Update the corresponding tables to change the value.
- Find the employees whose salary is between 5000 and 10000 but not exactly 7500.
- Find the employees whose name contains ‘en’.
- Try to delete a particular deptno. What happens if there are employees in it and if there are no employees.
- Create alias for columns and use them in queries.
- List the employees according to ascending order of salary.
- List the employees according to ascending order of salary in each department.
- Use ‘&&’ wherever necessary
- Amount 6000 has to be deducted as CM relief fund in a particular month which has to be accepted as input from the user. Whenever the salary becomes negative it has to be maintained as 1000 and the deduction amount for those employees is reduced appropriately.
- The retirement age is 60 years. Display the retirement day of all the employees.
- If salary of all the employees is increased by 10% every year, what is the salary of all the employees at retirement time.
- Find the employees who are born in leap year.
- Find the employees who are born on feb 29.
- Find the departments where the salary of atleast one employee is more than 20000.
- Find the departments where the salary of all the employees is less than 20000.
- On first January of every year a bonus of 10% has to be given to all the employees. The amount has to be deducted equally in the next 5 months. Write procedures for it.

TASK-8	**CURSORS**	

1. Write a PL/SQL block that will display the name, dept no, salary of fist highest paid employees.
2. Update the balance stock in the item master table each time a transaction takes place in the item transaction table. The change in item master table depends on the item id is already present in the item master then update operation is performed to decrease the balance stock by the quantity specified in the item transaction, in case the item id is not present in the item master table then the record is inserted in the item master table.
3. Write a PL/SQL block that will display the employee details along with salary using cursors.
4. To write a Cursor to display the list of employees who are working as a Managers or Analyst.
5. To write a Cursor to find employee with given job and deptno.
6. Write a PL/SQL block using implicit cursor that will display message, the salaries of all the employees in the 'employee' table are updated. If none of the employee's salaryare updated we get a message 'None of the salaries were updated'. Else we get a message

TASK-9	PROCEDURES AND FUNCTIONS	

1. Write a function to accept employee number as parameter and return Basic +HRA together as single column.
2. Accept year as parameter and write a Function to return the total net salary spent for a given year.
3. Create a function to find the factorial of a given number
4. Create function to the reverse of given number.

TASK-10	TRIGGERS	

1. Create a row level trigger for the customers table that would fire for INSERT or UPDATE or DELETE operations performed on the CUSTOMERS table. This trigger will display the salary difference between the old values and new values: CUSTOMERS table:

Id	**Name**	**Age**	**Address**	**Salary**
1	Sri Lakshmi	34	Kurnool	50000
2	Sreedhar	36	Hyderabad	80000
3	Neetu	30	Chennai	30000
4	Nymisha	29	Delhi	20000
5	Nishitha	25	Bombay	40000
6	Jyothsna	29	kurnool	60000

2. Creation of insert trigger, delete trigger, update trigger practice triggers using the passenger database. Passenger(Passport_ id INTEGER PRIMARY KEY, Name VARCHAR (50) Not NULL, Age); Integer Not NULL, Sex Char, Address VARCHAR (50) Not NULL

a. Write a Insert Trigger to check the Passport_id is exactly six digits or not.
b. Write a trigger on passenger to display messages '1 Record is inserted', '1 record is deleted', '1 record is updated' when insertion, deletion and updation are done on passenger respectively.

3. Insert row in employee table using Triggers. If any employee has same name it must be replaced by new name. These triggers can be raised before insert, update or delete rows on data base.
4. Convert employee name into uppercase whenever an employee record is inserted or updated. Trigger to fire before the insert or update.

A Trigger before deleting a record from emp table. Trigger will insert the row to be deleted into table called delete _emp and also record user who has deleted the record and date and time of delete.

TASK-11	CASE STUDY GENERAL HOSPITAL	

A General Hospital consists of a number of specialized wards (such as Maternity, Pediatric, Oncology, etc). Each ward hosts a number of patients, who were admitted on the recommendation of their own GP and confirmed by a consultant employed by the Hospital. On admission, the personal details of every patient are recorded. A separate register is to be held to store the information of the tests undertaken and the results of a prescribed treatment. A number of tests may be conducted for each patient. Each patient is assigned to one leading consultant but may be examined by another doctor, if required. Doctors are specialists in some branch of medicine and may be leading consultants for a number of patients, not necessarily from the same ward. For the above case study, do thefollowing.

1. Analyze the data required.
2. Normalize the attributes.

Create the logical data model using E-R diagrams.
Create tables and generate Queries

TASK-12	CASE STUDY: CAR RENTAL COMPANY	

A database is to be designed for a car rental company. The information required includes a description of cars, subcontractors (i.e. garages), company expenditures, company revenues and customers. Cars are to be described by such data as: make, model, year of production, engine size, fuel type, number of passengers, registration number, purchase price, purchase date, rent price and insurance details. It is the company policy not to keep any car for a period exceeding one year. All major repairs and maintenance are done by subcontractors (i.e. franchised garages), with whom CRC has long-term agreements. Therefore the data about garages to be kept in the database includes garage names, addresses, range of services and the like. Some garages require payments immediately after a repair has been made; with others CRC has made arrangements for credit facilities. Company expenditures are to be registered for all outgoings connected with purchases, repairs, maintenance, insurance etc. Similarly the cash inflow coming from all sources: Car hire, car sales, insurance claims must be kept of file. CRC maintains a reasonably stable client base. For this privileged category of customers special credit card facilities are provided. These customers may also book in advance a particular car. These reservations can be made for any period of time up to one month. Casual customers must pay a deposit for an estimated time of rental, unless they wish to pay by credit card. All major credit cards are accepted. Personal details such as name, address, telephonenumber, Drivinglicense,numberabouteachcustomerarekeptinthedatabase.Fortheabovecase.

study, do the following:

1. Analyze the data required.
2. Normalize the attributes.

Create the logical data model using E-R diagrams.
Create tables and generate Queries

TASK-13	CASE STUDY: STUDENT PROGRESS MONITORING SYSTEM	

A database is to be designed for a college to monitor students' progress throughout their course of study. The students are reading for a degree (such as BA, BA (Hons) M.Sc., etc) within the framework of the modular system. The college provides a number of modules, each being characterized by its code, title, credit value, module leader, teaching staff and the department they come from. A module is coordinated by a module leader who shares teaching duties with one or more lecturers. A lecturer may teach (and be a module leader for) more than one module. Students are free to choose any module they wish but the following rules must be observed: Some modules require pre- requisites modules and some degree programmes have compulsory modules. The database is also to contain some information about students including their numbers, names, addresses, degrees they read for, and their past performance i.e. modules taken and examination results. For the above case study, do the following:

1. Analyze the data required.
2. Normalize the attributes.
3. Create the logical data model i.e., ER diagrams.
4. Create tables and generate Queries

4. Laboratory Equipment/Software/Tools Required

SQL

5. Books and Materials

Text Books

1. *Data base Management Systems*, Raghurama Krishnan, Johannes Gehrke, McGrawHill Education, 3rd Edition, 2003.

COURSE STRUCTURE

A30422 –DIGITAL ELECTRONIC LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	40	60	100

1. Course DescriptionCourse

Overview

This laboratory course provides the students to study representation of switching functions using Boolean expressions and their minimization techniques, the combinational logic design of various logic and switching devices and their realization, the sequential logic circuits design both in synchronous and Asynchronous modes for various complex logic and switching devices.

Course Pre/corequisites

1. A30421 – Digital Electronics

2. Course Outcomes (COs)

After completion of the course, the learner will be able to:

A30422.1	Design digital logic circuits using software.
A30422.2	Verify the logical operations of the digital logic gates in the laboratory.
A30422.3	Analyze the functionality of Combinational and Sequential Circuits using LogiSIM.
A30422.4	Design and analyze the code converters using LogiSIM.
A30422.5	Design and analyze the counters using LogiSIM.

3. Course Syllabus

1. Realization of logic gates
2. Realization of Boolean function using basic gates
3. Realization of Boolean function using Universal gates
4. Implementation and verification of Code Converters
5. Implementation and verification of Half adder and Full adder
6. Implementation and verification of Half subtractor and Full subtractor
7. Implementation and verification of multiplexers
8. Implementation and verification of magnitude comparators
9. Design and verification of Flip-flops
10. Design and implementation of synchronous and ripple counters

4. Laboratory Equipment/Software/Tools Required:

1. Computers installed with operating system
2. Logisim simulation software tool

5. Books and Materials

Text Book(s)

1. M. Morris Mano, Michael D. Ciletti, *Digital Design*, 4th edition, Pearson Education/PHI,India, 2008
2. Thomas L. Floyd 2006, *Digital fundamentals*, 9th edition, Pearson EducationInternational, 2006

Reference Book(s)

1. Zvi. Kohavi*, Switching and Finite Automata Theory*, Tata McGraw Hill, India, 2004
2. C.V.S. Rao, Switching and Logic Design, 3rd edition, Pearson Education, India, 2009

COURSE STRUCTURE

A30516 – DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	40	60	100

1. Course Description

Course Overview

This Laboratory drives the learners to experience the complexity of a given algorithm and give programmatic solutions. It gives hands on practice in implementing various algorithmic design techniques, in solving problems. This helps the learners to solve the complex problems in any domain demanding algorithmic solutions.

Course Pre/Corequisites

1. A30504-Data Structures Laboratory
2. A30510-Object oriented programming through java laboratory

2. Course Outcomes (COs)

After completion of the course, the learner will be able to:

A30516.1	Apply basic programming techniques in solving given problem.
A30516.2	Design an algorithm for a given application program.
A30516.3	Utilize wrapper classes as per the demand of problem.
A30516.4	Apply the appropriate algorithmic technique for efficient problem solving.
A30516.5	Execute collection classes for dynamic programming.

3. Course Syllabus

List of Experiments

1. Create a Java class called Student with the following details as variables within it. (i) USN (ii) Name (iii) Branch (iv) Phone Write a Java program to create n Student objects and print the USN, Name, Branch, and Phone of these objects with suitable headings.
2. Write a Java program to implement the Stack using arrays. Write Push(), Pop(), and Display() methods to demonstrate its working.
3. Write a Java class called Customer to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write methods to read customer data as <name, dd/mm/yyyy> and display as <name, dd, mm, yyyy> using StringTokenizer class considering the delimiter character as"/".
4. Sort a given set of elements using the best sorting method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be

generated using the random number generator. Demonstrate using Java which technique is good to calculate time complexity analysis: worst case, average case and best case.

5. Write a java program to implement the following sorting techniques by using Divide and Conquer Method: a) Insertion Sort b) Selection sort
6. Write a java program for an array of jobs where every job has a deadline and associated profit if the job is finished before the deadline. It is also given that every job takes single unit of time, so the minimum possible deadline for any job is 1. How to maximize total profit if only one job can be scheduled at a time.
7. Write java code to check whether a given graph is strongly connected or not.
   Given an integer array nums, find the contiguous subarray (containing at least one number) which has the largest sum and return its sum.(Using Dynamic Programming) Example: Input: [-2,1,-3,4,-1,2,1,-5,4], Output: 6 Explanation: [4,-1,2,1] has the largest sum = 6.
8. Write a java for the given an undirected weighted connected graph consisting of n vertices and m edges. The task is to find any spanning tree of this graph such that the maximum degree over all vertices is maximum possible. The order in which you print the output edges does not matter and an edge can be printed in reverse also i.e. (u, v) can also be printed as (v, u).
9. Write a Java Program is to Implement Knight‟s Tour Problem.A knight‟s tour is a sequence of moves of a knight on a chessboard such that the knight visits every square exactly once. If the knight ends on a square that is one knight‟s move from the beginning square (so that it could tour the board again immediately, following the same path), the tour is closed, and otherwise it is open. The exact number of open tours on an 8×8 chessboard is still unknown.

10.a. Design and implement in Java to find a subset of a given set S = {Sl, S2,.....,Sn} of n positive integers whose SUM is equal to a given positive integer d.

b. Write a program to print all permutations of a given string using Backtracking.

4. Laboratory Equipment/Software/Tools Required

1. Open source Java Tool kit: JDK 8 and above versions
2. A diagramming tool: A diagramming tool lets you draw pictures of your network. Visio (from Microsoft).
3. A network discovery program: For larger networks, you may want to invest in a network discovery program such as Spice works.
4. A protocol analyzer: A *protocol analyzer* monitors and logs the individual packets that travel along your network. (Protocol analyzers are also called *packet sniffers.*) , Network Monitor tool.

5. Books and Materials

Text Book(s)

1. Ellis Horowitz, S. SatrajSahani and Rajasekhran, *Fundamentals of Computer Algorithms*,2nd Edition, University Press.2014.

Reference Book(s)

1. ParagHimanshu Dave, HimanshuBhalchandra Dave, *Design and Analysis of Algorithms*, Pearson Education, 2nd Edition, 2009.
2. T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein, *Introduction to Algorithms*, PHI Pvt. Ltd./ Pearson Education
3. R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, *Introduction to Design and Analysis of Algorithms A strategic approach*, McGraw Hill.

COURSE STRUCTURE

A33114 - Web Application Development

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	2	28	0	28	2	40	60	100

1.Course Description:

Course Overview

This course introduces students to developing web applications. This course presents the basics of HTML5 and CSS3, Other HTML tags for Web application Development. Learn to create links in HTML, Uses of HTML forms. Introduction to the use of Reactstrap for Bootstrap 4-based responsive UI design. React router and its use in developing single-page applications, designing controlled forms. Redux and use it to develop React-Redux powered applications, client-server communication and the use of REST API on the server side, React primitives render to native platform UI.

Course Pre-requisite

Fundamentals of Programming and Internet

2.Course Outcomes (CO):

After completion of the course, students will be able to

A33114.1 Programming skills in Html5, CSS3, and Bootstrap 4.

A33114.2 Developing skills of Web Applications user interactions using JavaScript (i.e. ES6+)

A33114.3 Web application Development Database with React and React Native.

3.Course Syllabus

List of Experiments

Week – 1: HTML LAYOUTS AND LINKS a. Develop a web application to control over different layouts. b. Create a webpage with HTML describing your department use paragraph and list tags. c. Apply various colors to suitable distinguish key words, also apply font styling like italics, underline and two other fonts to words you find appropriate, also use header tags. d. Create links on the words e.g. “Wi-Fi” and “LAN” to link them to Wikipedia pages.

Week – 2: WEB APLLICATION DESIGN FORMTTING a. Develop a web application with background banner image and navigation menus. b. Develop a web application with responsive images. c. Develop a web application using left menu. d. Develop setting to change the theme of entire web Application.

Week–3: INTRODUCTION TO RESPONSIVE INTERFACE USING BOOTSRAP. a. Write code for developing responsive web application with Admin panel and tables with static data

Week – 4: BUIDLING INTERFACES USING JAVASCRIPT a. Set up the Folder Structure. b. Write the Model code and initialize the application. c. Implement the list objects and use cases. d. Implement the create object use case. e. Implement the update object use case.

Week – 5: INTRODUCTION TO INTERATIVE FORMS AND AJAX DATA BINIDNG
a. Developing Web Page Styles using JavaScript and CSS, b. Develop Script interactive forms c. Data binding using Ajax.

Week – 6: REACT ENVIRONMENT SETUP
b. Integration with Existing Apps. c. Running on Device. d. Debugging e. Testing f. Write source code using Typescript.

Week – 7: PROGRAMMING WITH REACT
a. Basics Interactive examples. b. Function Components and Class Components c. React Native Fundamental, Handling Text Input, d. Using a scroll View, using List View. e. Platform Specific Code.

Week – 9: PHP SESSIONS BOX React FOR DATA VISUALIZATION
a. Introduction and scaffolding the Project. b. Pages and Layout. c. Working with an API, CSS-in-JS. d. Dynamic Pages and React Hooks. e. Custom React Hooks, Dynamic CSS-in-JS. f. Finishing up and Deployment. g. Optimization and PWA.

Week – 10: CHAT APPLICATION
a. Firebase Environment. Introduction and Scaffolding the project. b. Private and Public pages, Context API. c. Creating Side bar and Dashboard d. Creating and displaying Chat Rooms. e. Creating Layout for Chat page.

4.Textbooks And Materials:

References:

1. Adam Boduch and Roy Derks, “React and React Native: A Complete Hands-on Guide to Modern Web and Mobile Development with React.js”, 3rd Edition, 2020.
2. W Hans Bergsten, “Java Server Pages”, O’Reilly, 3rd Edition, 2003.
3. D. Flanagan, “Java Script”, O’Reilly, 6th Edition, 2011. 4. Jon Duckett, “Beginning Web Programming”, WROX, 2nd Edition, 2008.

Online Learning Resources/Virtual Labs:

1. https://nodejs.org/en/
2. https://expressjs.com/
3. https://www.mongodb.com/
4. https://reactjs.org/
5. https://www.netlify.com/

COURSE STRUCTURE
A30031-ENVIRONMENTAL SCIENCE

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	28	0	0	0	100*	---	100*

1. Course Description

Course Overview

This course is designed to create environmental awareness and consciousness among the present generation to become environmental responsible citizens. This course covers multidisciplinary nature of environmental studies, Natural Resources: Renewable and non-renewable resources; Ecosystems; Biodiversity and its conservation; Environmental Pollution; Social Issues and the Environment. Manufacture of Eco-friendly products, awareness on environment to the people; Human Population and the Environment; pollution control acts and Field Work. This course is divided into five chapters for convenience of academic teaching followed by field visits.

Course Pre/co requisites

This course has no pre/co-requisites.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to

A30031.1	Solve environmental problems through higher level of personal involvement and interest.
A30031.2	Apply ecological morals to keep up amicable connection among nature and human beings.
A30031.3	Recognize the interconnectedness of human dependence on the earth's ecosystems.
A30031.4	Apply environmental laws for the protection of environment and wildlife.
A30031.5	Influence society in proper utilization of goods and services.

3. Course Syllabus

UNIT -I

Introduction: Environment Definition, The multidisciplinary nature of environmental studies, Scope and importance-Need for public awareness. Natural Resources: Classification of resources: Renewable and Non-renewable resources. Forest resources: Uses and over exploitation of forests. Dams and their effects on forest and tribal people. Water resources: Use and over utilization of surface and ground water, conflicts over water. Food resources: Problems with Chemical fertilizers and pesticides. . Energy resources: Renewable energy resources: solar energy, wind energy and geothermal energy. Role of individual in conservation of natural resources

UNIT – II

Ecosystems: Ecosystem Definition. Structure of an ecosystem: Producers, Consumers and Decomposers. Function of ecosystems: Food chains, food webs and energy flow in an ecosystem. Ecological pyramids: Pyramid of number, Pyramid of biomass and Pyramid of energy. Introduction, types, characteristic features ,structure and function of the following ecosystem. A) Forest ecosystem B) Dessert system C)Aquatic ecosystems(ponds,rivers,ocean,estuaries).

Biodiversity and Its Conservation: Introduction and definition. Levels of biodiversity**,** Bio geographical classification of India ,Values of biodiversity(Consumptive value, productive value ,Social ,ethical and aesthetic value)Hot spots and Threats to biodiversity. In-situ and Ex-situ conservation of biodiversity.

UNIT-III

Environmental Pollution: Definition, causes, effects and control measures of Air Pollution, Water pollution, Soil pollution, Nuclear hazards, Global warming, Acid rains and Ozone layer depletion. Role of an individual in prevention of pollution. Solid waste management and Disaster management: floods, earthquakes, cyclone and landslides.

UNIT-IV

Social Issues and the Environment: Concept of sustainable development: Sustainable development goals. Threats to sustainability: Population explosion, crazy consumerism. Water conservation, Rainwater harvesting and environmental ethics. Environment Protection Act(Air, water, soil and wild life protection act)-Public awareness.

UNIT -V

Human population and the Environment: population growth, variation, value education-HIV/AIDS-women and child welfare-Role of IT in environment and human health. Fieldwork-visit to a local area to document environmental assets.

- Visit to local polluted site – Urban/Rural/Industrial /Agricultural).
- Study of common plants , insects , birds .
- Study of simple ecosystem –pond, river, estuaries)

4. Books and Materials

Text Books:

1. Anubha Kaushik, C.P. Kaushik,*Environmental Studies*, 4th edition, New age international publishers, 2014.
2. Anil K DE., Environmental Chemistry, New Age International Publication, 9th Edition

Reference Books:

1. ErachBharucha, *Textbook of Environmental Studies for Undergraduate Courses*. 1st edition, Universities press, 2005.
2. Benny joseph,*Environmental studies*, 3rd edition, McGraw Hill Education (India) Private Limited, 2018.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY, KURNOOL

R20-COURSE STRUCTURE

IV – SEMESTER

IV SEMESTER (II YEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A33106	Data Science	PC	3	0	0	3	40	60	100
A30506	Object Oriented Programming through Java	PC	3	0	0	3	40	60	100
A30016	Discrete Mathematics	BS	3	0	0	3	40	60	100
A30513	Operating Systems	PC	3	0	0	3	40	60	100
A30514	Software Engineering	PC	3	0	0	3	40	60	100
A33107	Data Science Laboratory	PC	0	0	3	1.5	40	60	100
A30508	Object Oriented programming through Java Laboratory	PC	0	0	3	1.5	40	60	100
A30517	Operating System Laboratory	PC	0	0	3	1.5	40	60	100
A33108	Unix & Shell Programming	SC	1	0	2	2	40	60	100
TOTAL			16	00	11	21.5	360	540	900
Internship 2 Months (Mandatory) during summer vacation									
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)			4	0	0	4	40	60	100

COURSE STRUCTURE

A33106 DATA SCIENCE

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	40	60	100

1. Course Description

Course Overview

The main objective of the course is to identify the characteristics of datasets and emerging technologies in data science. This course also Understand the Basics of Big Data, Machine learning, deep learning and data visualization.

Course Pre/corequisites

A33101-Fundamentals of AI

2. Course Outcomes (COs)

After completion of the course, the learner will be able to:

A33106.1 Understand the fundamental concepts of data science

A33106.2 Evaluate the data analysis techniques for applications handling large data

A33106.3 Demonstrate the various machine learning algorithms used in data science process

A33106.4 Understand the ethical practices of data science

A33106.5 Visualize and present the inference using various tools

3. Course Syllabus

UNIT-I

INTRODUCTION TO DATA SCIENCE: Definition – Big Data and Data Science Hype – Why data science – Getting Past the Hype – The Current Landscape – Data Scientist –stages of analytics- Data Science Process Overview –Defining goals – Retrieving data – Data preparation – Data exploration – Data modeling –Presentation.

UNIT-II

BIG DATA : Problems when handling large data – General techniques for handling large data – Case study– Steps in big data – Distributing data storage and processing with Frameworks – Case study.

UNIT-III

MACHINE LEARNING: Machine learning – Modeling Process – Training model – Validating model – Predicting new observations –Supervised learning algorithms – Unsupervised learning algorithms.

UNIT-IV

DEEP LEARNING: Introduction – Deep Feedforward Networks – Regularization – Optimization of Deep Learning– Convolutional Networks – Recurrent and Recursive Nets – Applications of Deep Learning.

UNIT-V

DATA VISUALIZATION: Introduction to data visualization –various graphical techniques to understand data, Data visualization options – Filters – Map Reduce – Dashboard development tools – Creating an interactive dashboard with dc.js-summary.

4. Books and Materials

Text Books

1. Introducing Data Science- Davy Cielen- Arno D. B. Meysman- Mohamed Ali- Manning Publications Co.- 1st edition- 2016

2. An Introduction to Statistical Learning: with Applications in R- Gareth James- Daniela Witten- Trevor Hastie- Robert Tibshirani- Springer- 1st edition- 2013

3. Deep Learning- Ian Goodfellow- YoshuaBengio- Aaron Courville- MIT Press- 1st edition-2016

Reference Book(s)

1. Data Science from Scratch: First Principles with Python- Joel Grus- O'Reilly- 1st edition-2015

2. Doing Data Science- Straight Talk from the Frontline- Cathy O'Neil- Rachel Schutt- O' Reilly-1st edition- 2013

COURSE STRUCTURE

A30506 –OBJECT ORIENTED PROGRAMMING USING JAVA

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	40	60	100

1. Course Description

Course Overview

This course provides a comprehensive coverage of Object Oriented Programming concepts using Java. It covers abstract data types, Strings, arrays. It also covers interfaces, inheritance, packages, exception handling, multithreading, files and swings. This course helps the students to choose their career as software engineers.

Course pre/corequisites

A30501-Python Programming

2. Course Outcomes (COs)

After completion of the course, the learner will be able to:

A30506.1	Apply object oriented concepts for solving general purpose problems
A30506.2	Use inheritance, user defined packages and interfaces for code reusability
A30506.3	Apply exception handling and multithreading for robust and efficient application development
A30506.4	Implement collection frameworks to store and retrieve data efficiently
A30506.5	Build GUI applications using swings for user interface design

3. Course Syllabus

UNIT I

The History and Evolution of Java- History of java, java's magic: the byte code, java buzzwords, evolution of java, object oriented programming. Data Types, Arrays, Variables and Operators- Primitive types, literals, variables, type conversion and casting, arrays, string class, pointers, operators.

UNIT II

Control Statements- Selection statements, iteration statements, jump statements. Introducing classes- Class fundamentals, objects, methods, constructors, this keyword, garbage collection, overloading, argument passing, recursion, static, command line and variable length arguments.

UNIT III

Inheritance- Basics, using super, multi-level hierarchy, method overriding, dynamic method dispatch, abstract class, final with inheritance. Packages and Interfaces- Packages, access protection, interfaces, default interfaces, default interface methods, static methods in an interface. Exception Handling- Fundamentals, exception types, nested try statements, throw, throws, finally, built-in and user defined exceptions, chained exceptions.

UNIT IV

Multithreaded Programming: Thread model, main thread, creating thread, isalive() and join(), thread priorities, synchronization, inter thread communication, suspending, resuming and stopping threads, obtaining a thread state. Input and Output Operations: I/O basics, reading console input, writing console output, the Print Writer class, reading and writing files, automatically closing a file.

UNIT V

Collections Framework: Collection classes- Array List, Linked List, Hash Set, Tree Set, Using an Iterator and Spliterators. Swings: The origins of swing, two key swing features, components and containers, the swing packages, a simple swing application, event handling, create a swing applet, exploring swing.

4. Books and Materials

Text Book(s)

1. Herbert Schildt, *Java The Complete Reference*, MC Graw Hill Education, 9th edition, 2016.

Reference Book(s)

1. T. V. Suresh Kumar, B.Eswara Reddy, P.Raghavan, *Programming with Java,* Pearson, 2011.
2. Paul Deitel, Harvey Deitel, *Java – How to Program,* Pearson, 2nd edition, 2012.
3. Kathy Sierra, Bert Bates, *Head First Java,* O'Reilly, 2nd edition, 2005.

COURSE STRUCTURE

A30016- DISCRETE MATHEMATICS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	40	60	100

1. Course Description

Course Overview

This course will simplify and evaluate basic logic statements. It solves problems using operations on sets, functions, recurrence relations to analyze algorithms, algebraic structure, counting, graph theory and traversal techniques. The learner will be able to develop mathematical models for computing problems.

Course Pre/co requisites

A30002 Mathematics -1

2. Course Outcomes (COs)

After completion of the course, learner will be able to:

A30016.1 Apply the logic statements and connectives to solve real time problems

A30016.2 Classify algebraic structure and relations for a given mathematical problem

A30016.3 Analyze the basic results in combinatorics and binomial thermos for accuracy

A30016.4 Apply various recurrence relations to find solutions for numeric sequences

A30016.5 Apply graph theory techniques to solve network problems

3. Course Syllabus

UNIT-I

Mathematical Logic : Statements and Notation, Well Formed Formulas, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Validity using Truth Tables, Rules of Inference, Consistency of Premises and Indirect Method of Proof, Automatic Theorem Proving, Predicates, The Statement Function, Variables and Quantifiers, Predicate Formulas

UNIT-II

Relations And Functions: Properties of binary Relations in a Set, Relation Matrix and the Graph of a Relation, Partition and Covering of a Set, Equivalence Relations, Compatibility Relations, Partial Ordering, Hasse Diagram. Functions, Composition of Functions.

UNIT-III

Algebraic Structures: Algebraic Systems, Simple Algebraic Systems and General Properties, Semi Groups and Monoids, Groups, Subgroups, Homomorphism, Isomorphism. Elementary Combinatorics: Basics of Counting, Combinations and permutations, Binomial Coefficients, The Binomial and Multinomial Theorems, The Principle of Inclusion-Exclusion, Pigeonhole Principle and its Applications.

UNIT-IV

Recurrence Relations: Generating Functions of Sequences, Calculating Coefficients of Generating functions, Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, The Method of Characteristic Roots, Solutions of Inhomogeneous Recurrence Relations.

Unit-V

Graph Theory: Basic Concepts, Representation of Graphs, Isomorphism and Sub graphs, Spanning Trees, Planar Graphs, Euler's Formula, Multi graphs and Euler circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

4. Books and Materials

Text Book(s)

1. J.P.Tremblay, R.Manohar*, Discrete Mathematical Structures with Applications to Computer Science*. TMH, 2015.
2. Joe L. Mott. Abraham Kandel and Theodore P. Baker, *Discrete Mathematics for Computer Scientists & Mathematicians,* 2nd Edition, Pearson, 2015.

Reference Book(s)

1. N. Chandrasekaran, M. Umaparvathi, *Discrete Mathematics*, PHI Learning Pvt. Ltd, 2012.
2. BernandKolman, Roberty C. Busby, Sharn Cutter Ross, *Discrete Mathematical Structures*. Pearson Education, 2014.

COURSE STRUCTURE
A30513 – OPERATING SYSTEMS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	40	60	100

1. Course Description

Course Overview

This course makes the students understand the basic concepts of various operating systems. It covers processes, threads, scheduling, synchronization, deadlocks, memory management, file & I/O subsystems and protection concepts. The learners of this course can choose their career as system programmers.

Course Pre/corequisites

A30501- Computer Programming

2. Course Outcomes (COs)

After completion of the course, the learner will be able to:

A30513.1 Apply the basic principles of Operating Systems in system programming

A30513.2 Apply the process synchronization concepts in multiprogramming environment

A30513.3 Solve the memory management problems with paging and segmentation techniques

A30513.4 Design algorithmic strategies to handle deadlock problems

A30513.5 Implement the concepts of secured file system for confidentiality and authentication.

3. Course Syllabus

UNIT-I

Operating system functions, structure, Operations, protection and security, Computing Environments, Open- Source OS. System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, operating system debugging, System Boot.

UNIT-II

Processes: Process concept, Scheduling, Operations, Inter process Communication. Process Synchronization: The critical-section problem, Peterson‘s Solution, Synchronization Hardware, Synchronization algorithms.

UNIT-III

CPU Scheduling: Scheduling-Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling, Algorithm Evaluation. Swapping, contiguous memory allocation, segmentation, paging, structure of the page table. Virtual memory: demand paging, page-replacement, Allocation of frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory

UNIT-IV

Deadlocks: System Model, deadlock characterization, Methods of handling Deadlocks, Deadlock prevention, Detection and Avoidance, Recovery from deadlock. Overview of Mass-storage structure, Disk structure, Disk attachment, Disk scheduling, Swap-space management, RAID structure, Stable-storage implementation.

UNIT-V

File system Implementation: File-system structure, File-system Implementation, Directory Implementation, Allocation Methods, Free-Space management. Protection**:** Goals of Protection, Principles of Protection, Domain of protection, Access Matrix, Implementation of Access Matrix, Access control, Revocation of Access Rights.

4. Books and Materials

Text Book(s)

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, *Operating System Concepts*, Wiley, 8th Edition, 2014.

Reference Book(s)

1. Andrew S Tanenbaum, *Modern Operating Systems*, Second Edition, PHI.
2. G.Nutt, N.Chaki and S.Neogy, *Operating Systems*, Third Edition, Pearson Education

COURSE STRUCTURE

A30514 – SOFTWARE ENGINEERING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	40	60	100

1. Course Description

Course Overview

This course deals with engineering principles and programming languages applied in software development. The course will orient the students to the different software process models, software requirements engineering process, systems analysis and design as a problem-solving activity, with focus on quality. The knowledge acquired through this course is used to handle projects efficiently with minimizing cost and complexity.

Course Pre/corequisites

A30501-Python Programming

2. Course Outcomes (COs)

After the completion of the course, the learner will be able to:

A30514.1 Understand the various phases of software development life cycles and software Requirements.

A30514.2 Possess necessary skills to elicit the requirements of a software system and to create well written software documentation involving appropriate system models.

A30514.3 Design, implement and evaluate a computer based system, process, component or program to meet desired needs within realistic constraints specific to the field

A30514.4 Construct software projects by integrating components with appropriate user interface

A30514.5 Apply various testing strategies to verify, validate and to release error free software

3. Course Syllabus

UNIT I

Software and Software Engineering: The Characteristics of Software, the Distinctive Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths. Process Models: A General Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology, Product and Process. Agile Development: Agility, Agility and the Cost of Change, Agile Process, Extreme Programming, Other Agile Process Models.

UNIT II

Requirements Engineering: Understanding Requirements: Requirements Engineering, Establishing the groundwork, Eliciting Requirements, Developing Use Cases, Building the requirements model, Negotiating Requirements, Validating Requirements. Requirements Modeling (Scenarios, Information and Analysis Classes): Requirements Analysis, Scenario-Based Modeling, UML Models that Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling. Requirements Modeling (Flow, Behavior, Patterns and WEBAPPS): Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Requirements Patterns Modeling,

UNIT III

Design Concepts: Design with Context of Software Engineering, The Design Process, Design Concepts, The Design Model. Architectural Design: Software Architecture, Architecture Genres, Architecture Styles, Architectural Design, Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow.

UNIT IV

User Interface Design: The Golden Rules, UI Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evaluation. WebApp Design: WebApp Design Quality, Design Goal, A Design Pyramid for WebApps, WebApp Interface Design, Aesthetic Design, Content Design, Architecture Design, Navigation Design, Component-Level Design, Object-Oriented Hypermedia Design Method.

UNIT V

Software Testing Strategies: A Planned Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing, The Art of Debugging. Testing Conventional Applications: Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, basic Path testing, Control Structure Testing, Black-Box Testing, Model-based Testing. Testing Object-Oriented Applications: Broadening the View of Testing, Testing with OOA and OOD Models, Object-Oriented Testing Strategies, Object-Oriented Testing Methods.

4. Books and Materials

Text Book(s)

1. Roger S. Pressman *Software engineering A practitioners Approach*, McGraw Hill International Education, Seventh Edition, 2016.

Reference Book(s)

1. IAN Sommerville, *Software Engineering*, Ninth Edition. *Pearson, Ninth edition*
2. Rajib Mall , *Fundamentals of Software Engineering*, Fourth Edition, , PHI.
3. Pankaj Jalote ,*Software Engineering, A Precise Approach*, , Wiley India,2010.

COURSE STRUCTURE

A33107– DATA SCIENCE LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	40	60	100

1. Course Description

Course Overview

The main objective of this Laboratory is to Learn the basics of data science concepts in practice. This course offers the modern programming language R that shall help the students to implement the various concepts practically so that the students will be able to program in the R studio with the usage of R programming

Course Pre/corequisites

A30513– DATA SCIENCE

2. Course Outcomes (COs)

After the completion of the course, the learner will be able to:

A33107.1 Apply Abstraction to create models based on the real world.

A33107.2 Understand several techniques from previously established paradigms, including modularity, encapsulation and Polymorphism.

A33107.3 Apply greater flexibility and maintainability in programming.

A33107.4 Improve the knowledge on Objects and class.

3. Course Syllabus

1. Introduction to R and simple Programs on data types
2. Simple Programs on R Objects
3. Programs on control statements Using R
4. Simple Programs using functions Using R
5. Programs on R reading and writing data from files
6. Programs using loop functions
7. Programs to implement charts (Bar Chart & Histogram in R with Example)
8. Import Data into R: Read CSV, Excel
9. Programs to implement Correlation in R: Pearson & Spearman with Matrix Example
10. Programs on R Aggregate Function: Summarise & Group_by () Example
11. Program to Scatter Plot in R using ggplot2 (with Example)

3. Laboratory Equipment/Software/Tools Required

SOFTWARE: Dev C++, Turbo C++

4. Books and Materials

1. 1. Barkakatin, objects-oriented programming in C++, PHI, 1995.
2. 2. Lafore, Object Oriented Programming in C++, Fourth Edition, Pearson Education.

COURSE STRUCTURE

A30508–OBJECT ORIENTED PROGRAMMING THROUGH JAVA LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	40	60	100

1. Course Description

Course Overview

This course provides hands on experience in applying object oriented concepts using Java. The learner will be able to practically handle problems related to arrays, Strings, interfaces, inheritance, packages, exception handling, multithreading, files and swings and give effective solution programmatically. This helps the students to choose their career as software engineers.

Course Pre/corequisites

1. A30501-Python Programming
2. A30506- Object Oriented Programming Using Java

2. Course Outcomes (COs)

After the completion of the course, the learner will be able to:

A30508.1 Design solutions for the problems of general purpose applications using object oriented concepts.

A30508.2 Generate reusable codes using inheritance, user defined packages and interface

A30508.3 Write robust and efficient code using exception handling and multithreading concepts

A30508.4 Implement collection frameworks and file handling techniques to store and retrieve data

A30508.5 Design user interface using swings

3. Course Syllabus

Lab Experiments:

1. Installation of Java software and study of any integrated development environment. Learn to compile, debug and execute java programs.
2. Write java program that inputs 5 numbers, each between 10 and 100 inclusive. As each number is read, display it only if it is not a duplicate of any number already read. Display the complete set of unique values input after the user enters each new value.
3. Write a java program to create a super class called Figure that receives the dimensions of two dimensional objects. It also defines a method called area that computes the area of an object. The program derives two subclasses from Figure. The first is Rectangle and second is Triangle. Each of the sub classes override area() so that it returns the area of a rectangle and triangle respectively.
4. Develop a java application for Banking transactions by using inheritance concept.
5. Create an interface for stack with push and pop operations. Implement the stack in two ways: fixed size stack and Dynamic stack
6. Write Java program(s) which uses the exception handling features of the language, creates exceptions and handles them properly, uses the predefined exceptions, and create own exceptions.

7. Write a Java program that creates three threads. First thread displays “Good Morning ”every one second, the second thread displays “Hello” every two seconds and the third thread displays “Welcome” every three seconds.
8. Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.
9. Write a java program to split a given text file into n parts. Name each part as the name of the original file followed by .part<n> where n is the sequence number of the part file.
10. Write a java program to find and replace pattern in a given file.
11. Implement collection frameworks to retrieve data.
12. Write a java program to handle mouse events.
13. Write a java program to handle keyboard events.
14. Develop a swing program for waving a Flag using applets and threads.
15. U sing swings design a simple calculator which performs all arithmetic operations.
16. Write a java program that allows conduction of object type examination containing multiple choice questions, and true/false questions. At the end of the examination when the user clicks a button the total marks have to be displayed in the form of the message.

4. Laboratory Equipment/Software/Tools Required

1. Open source Java Tool kit: JDK 8 and above versions

5. Books and Materials

Text Book(s)

1. Herbert Schildt. *Java The Complete Reference*. MC GRAW HILL Education, 9th Edition, 2016.

Reference Book(s)

1. T. V. Suresh Kumar, B.Eswara Reddy and P.Raghavan. *Programming with Java.* Pearson, 2011.
2. Paul Deitel and Harvey Deitel. *Java – How to Program.* Pearson, 2nd Edition, 2012.
3. Kathy Sierra and Bert Bates. *Head First Java.* O’Reilly, 2nd Edition, 2005.

COURSE STRUCTURE

A30517– OPERATING SYSTEMS LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	40	60	100

1. Course Description

Course Overview

This course makes the students practice the basic concepts of various operating systems. It gives hands on experience with lab programs covering the topics of processes, threads, scheduling, synchronization, deadlocks, memory management, file & I/O subsystems. The learners of this course can choose their career as system programmers.

Course Pre/corequisites

A30515: Operating Systems

2. Course Outcomes (COs)

After completion of the course, the learner will be able to:

A30517.1 Apply appropriate CPU scheduling algorithm for the given problem.

A30517.2 Perform resource management for optimal utility of CPU.

A30517.3 Implement algorithms handling deadlock problems

A30517.4 Implement the concepts of secured file system for confidentiality and authentication.

A30517.5 Apply threading concepts to handle concurrency.

3. Course Syllabus

1. Simulate the following CPU scheduling algorithms
   a) Round Robin b) SJF c) FCFS d) Priority
2. Simulate all file allocation strategies
   a) Sequential b) Indexed c) Linked
3. Simulate MVT and MFT
4. Simulate all File Organization Techniques
   a) Single level directory b) Two level c) Hierarchical d) DAG
5. Simulate Bankers Algorithm for Dead Lock Avoidance
6. Simulate Bankers Algorithm for Dead Lock Prevention
7. Simulate all page replacement algorithms
   a) FIFO b) LRU c) LFU Etc. …
8. Simulate Paging Technique of memory management
9. Control the number of ports opened by the operating system with
   a) Semaphore b) monitors
10. Simulate how parent and child processes use shared memory and address space

11. Simulate sleeping barber problem
12. Simulate dining philosopher's problem
13. Simulate producer and consumer problem using threads (use java)
14. Simulate little's formula to predict next burst time of a process for SJF scheduling algorithm.
15. Develop a code to detect a cycle in wait-for graph
16. Develop a code to convert virtual address to physical address
17. Simulate how operating system allocates frame to process
18. Simulate the prediction of deadlock in operating system when all the processes announce their resource requirement in advance.

4 Laboratory Equipment/Software/Tools Required:

1. Computers installed with operating system
2. C Compiler

5 Books and Materials

Text Book(s)

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, *Operating System Concepts*, Wiley, 8th Edition, 2014.

Reference Books:

1. Operating System Concepts, Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Eighth edition, John Wiley.
2. Operating Systems: Internals and Design Principles, Stallings, Sixth Edition–2009, Pearson Education
3. Modern Operating Systems, Andrew S Tanenbaum, Second Edition, PHI.
4. Operating Systems, S.Haldar, A.A.Aravind, Pearson Education.
5. Principles of Operating Systems, B.L.Stuart, Cengage learning, India Edition.2013-2014
6. Operating Systems, A.S.Godbole, Second Edition, TMH.
7. An Introduction to Operating Systems, P.C.P. Bhatt, PHI.

COURSE STRUCTURE
A33108– UNIX & SHELL PROGRAMMING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
1	0	2	14	0	28	2	40	60	100

1. Course Description

Course Overview

The main objective of this course is to familiarize with the Unix/Linux command line and running simple commands and concept of environment variables and with the simple use of environment variables.

Course Pre/Co-requisites

No Pre-requisities

2. Course Outcomes (COs)

After completion of the course, the student will be able to:

A33108.1 Understand the basic unix/linux commands

A33108.2 Learn importance of shell scripting

A33108.3 Apply shell programming to various files

A33108.4 Improve individual / teamwork skills, communication & report writing skills with ethical values

3. Course Syllabus

Basic Linux Commands : Study of Unix/Linux general purpose utility command list obtained from (man, who, cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown) commands, study of vi editor, study of Unix/Linux file system

Introduction to Shell : Introduction to Shell, Shell responsibilities, running a shell script. Variables, passing arguments, Basic Operators, Basic String Operations, Decision Making, Loops, Arrays, Arrays – Comparison, Shell functions.

Advanced Shell : Special Variables, Bash trap command, File Testing, Input Parameter Parsing, Pipelines, Process Substitution, Regular Expressions, Special Commands: sed, awk, grep, sort.

Example Programs:

1. Use of Basic UNIX Shell Commands: ls, mkdir, rmdir, cd, cat, touch, file, wc,

   sort, cut,grep,dd, dfspace, du, ulimit
2. Commands related to inode, I/O redirection and piping, process control commands, mails.
3. Shell Programming: Shell script exercises based on following:

   (i) Interactive shell scripts (ii) Positional parameters (iii) Arithmetic (iv) if-then-fi, if-then-

else-fi, nested if-else (v) Logical operators (vi) else + if equals elif, case structure (vii) while, until, for loops, use of break

4. Write a shell script to create a file. Follow the instructions
   (i) Input a page profile to yourself, copy it into other existing file
   (ii) Start printing file at certain line
   (iii) Print all the difference between two file, copy the two files.
   (iv) Print lines matching certain word pattern.
5. Write shell script for-
   (i) Showing the count of users logged in,
   (ii) Printing Column list of files in your home directory
   (iii) Listing your job with below normal priority
   (iv) Continue running your job after logging out
6. Write a shell script to change data format. Show the time taken in execution of this script.
7. Write a shell script to print files names in a directory showing date of creation & serialnumberof the file.
8. Write a shell script to count lines, words, and characters in its input (do not use wc).

4. Books and Materials

Text Book(s)

1. Learning the bash Shell, 3rd Edition by Cameron Newham, Publisher(s): O'Reilly Media, Inc., ISBN: 9780596009656.

Reference Book(s)

1. UNIX and Shell Programming by Behrouz A. Forouzan, Richard F. Gilberg Publisher: Thomson Press (India) Ltd, ISBN: 9788131503256, 9788131503256.
2. Shell Scripting: Expert Recipes for Linux, Bash, and More by Steve Parker