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 2022- 2023)
&
B.Tech (Lateral Entry Scheme)
(for the batches admitted from the academic year 2023 - 2024)

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 Course: Student who does not obtain minimum prescribed attendance in a course shall be detained in that particular course.

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): MOOC courses inculcate the habit of self-learning. MOOC courses would be additional choices in all the elective group courses.

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

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

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

Program: Means, UG degree program: Bachelor of Technology (B.Tech); 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 - R18" 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.

Student Outcomes: The essential skill sets that need to be acquired by every student during her/his program of study. These skill sets are in the areas of employability, entrepreneurial, social and 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 2022-23
&
For B.Tech Lateral Entry batches admitted from the academic year 2023 -2024

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 163 credits and secures all 163 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.	Artificial Intelligence	31
7.	Data Science	32
8.	Artificial Intelligence and Machine Learning	33
7.	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	0	1.5/3.0
Project work Phase	0	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	13.5
2	Basic Sciences	Basic Science courses	BS	21
3	Engineering Science courses	Engineering Science Courses including workshop, drawing, basics of electrical/mechanical/computer 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	16.5
7	Project Work	project wok, Seminar, Internship in industry elsewhere	16.5	15
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		163

Category	Suggested Credit Breakup APSCHE	Suggested Credit Breakup AICTE
Humanities and social science including Management courses (HS)	**13.5**	**15**
Basic Science courses (BS)	**21**	**25**
Engineering science courses including WS, drawing, Basics of electrical/mech/comp etc. (ES)	**24**	**24**
Professional core Courses (PC)	**51**	**48**
Open Courses- Electives from other technical and or emerging courses (OE)	**12**	**18**
Professional Elective courses relevant to chosen specialization/branch (PE)	**15**	**18**
Project work, seminar and internship in industry or elsewhere (PW)	**16.5**	**15**
Mandatory courses (Environmental sciences, Induction program, Indian constitution, Essence of Indian Traditional Knowledge (MC)	**0**	**0**
Skill Oriented Courses/Certification Courses (SOC)	**10**	**---**
TOTAL CREDITS	**163**	**163**

6. Weightage for course evaluation

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.

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.

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 1hour 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 containing3 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.

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 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 each for 10 Marks.
Note: The answers for Part A and Part B shall be written in two separate answer books.

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.

There shall be mandatory courses with zero credits. There shall be no external examination. However, attendance in the audit 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.

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 teacher 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. There shall be no objective paper in internal examination. 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.

There shall be two comprehensive assessments, one at the end of IV Semester and the other at the end of VI Semester, with 100 objective questions for 100 marks on the subjects studied in the respective years. A student shall acquire 1 credit assigned to each of the comprehensive online examination when he/she secures 40% or more marks. In case, if a student fails in comprehensive online examination, he/she shall re-appear/re-register by following a similar procedure adopted for the lab examinations.

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.

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 Head of the Department during the program. Each of the Courses must be of minimum 12 weeks in duration. Attendance shall not be monitored for MOOCs. The student has to acquire a certificate for the MOOC from the NPTEL in order to earn 3 Credits.

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

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 8.5 (for SC/ST students CGPA 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 Head of the Department corresponding to the Minor Programme) each for 2 credits and with a minimum duration of 8 weeks.

d. For MOOCs, attendance shall not be monitored. The students have to acquire a certificate from the respective agencies offering the MOOCs with pass grade/marks.

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 enlisted a set of subjects from its curriculum which are core for the discipline without any prerequisites. The Evaluation pattern of theory subjects and minor discipline project work will be similar to the regular programme evaluation. The minor discipline project shall be evaluated by the committee consisting of Head of the Department along with the two senior faculty members of the department.

e. Students are not allowed to pursue minor discipline programme subjects under Self study and/or MOOCs manner.

f. 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.

g. 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).

h. 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.

i. 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.

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

k. 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.

l. 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.

Honors degree in a discipline:

1. 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.

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.

2. 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.
3. For MOOCs, attendance shall not be monitored. The students have to acquire a certificate from the respective agencies offering the MOOCs with pass grade/marks.
4. The Evaluation pattern of theory subjects shall be similar to the regular programme evaluation.
5. 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: All the courses done under the dropped Honors will be shown in the transcript. None of the courses done under the dropped Honors will be shown in the transcript.
6. 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 mentioned the additional courses completed by them.
7. Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor's degree.

NSS is compulsory for all the Undergraduate students. The activities shall be beyond class hours. The student participation shall be for a minimum period of 45 hours during the first year. Gradeswill be awarded as Very good, Good, Satisfactory in the mark sheet on the basis of participation, attendance, performance and behaviour. If a student gets Unsatisfactorygrade, he/she has to repeat the above activity in the subsequent years along withthe first yearstudents.

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 & 3 credits respectively. Theinternshipcan be done bythe students at local industries, Govt. Organizations, construction agencies, Industrial estates, Hydel and thermal power projects and also in software MNCs. The student shall submit a detailed technical report along with internship certificate from the Internship organization in order to obtain the prescribed credits. 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 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 only for 100 marks. 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 shall be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships, whenever there is an exigency when students cannot pursue their summer internships. 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.

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.

There shall be five skill-oriented courses offered during III to VII semesters. 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. The credits assigned to the skill advanced course shall be awarded to the student upon producing the Course Completion Certificatefromtheagencies/professionalbodies.

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 University examinations if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects in a 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.
- 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 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 readmission for that semester when offered next.
- A stipulated fee shall be payable towards condonation of shortage of attendance to the college.
  (a) A student is eligible to write the University examinations if he acquires a minimum of 50% in each subject and 75% of attendance in aggregate of all the subjects.

8. Minimum Academic Requirements:

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

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 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 audit courses and technical seminar & comprehensive viva – voce he/she should secure 40% of the total marks.

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.

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 in case if 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.

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.

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 **audit** 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 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 rejoining.

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, Comprehensive Viva-Voce 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 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

(x) 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 writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
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	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.

	any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
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.(R19)
(LATERAL ENTRY SCHEME)

(Effective for the students getting admitted into II year through Lateral Entry Scheme from the Academic Year 2023-2024 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 124 credits and secures all *124* credits from III semester to VIII semester of Regular B. Tech. program.

(a) 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.

(b) 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 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 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 shall be placed in one of the following four classes:

First Class with Distinction	70% and above	From the aggregate Marks secured for 121 Credits (i.e. II year to IV year)
First Class	Below 70% but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

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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PROGRAMMECURRICULUM STRUCTURE UNDER R20 REGULATIONS

B. TECH – COMPUTER SCIENCE AND ENGINEERING –ARTIFICIAL INTELLIGENCE &MACHINE LEARNING (CSM)

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	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	-	- http://www.gpcet.ac.in/	-
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	Human Values & Professional Ethics	MC	3	0	0	0	-	-	-
20SIP09	Communication Skills - focus on Listening, Speaking, Reading, Writing skills	BS	2	1	2	0	-	-	-
	TOTAL		16	3	22	0			-

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PROGRAMMECURRICULUM STRUCTURE UNDER R20 REGULATIONS

B. TECH – COMPUTER SCIENCE AND ENGINEERING – ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (CSM)

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	40	60	100
A30005	Chemistry	BS	3	0	0	3	40	60	100
A30501	Python Programming	ES	3	0	0	3	40	60	100
A30203	Basic Electrical and Electronics Engineering	ES	3	0	0	3	40	60	100
A30302	Engineering Workshop	ES	1	0	4	3	40	60	100
A30502	Python Programming Lab	ES	0	0	3	1.5	40	60	100
A30009	Chemistry Lab	BS	0	0	3	1.5	40	60	100
A30204	Basic Electrical and Electronics Engineering Lab	ES	0	0	3	1.5	40	60	100
	TOTAL		**13**	**00**	**13**	**19.5**	**320**	**480**	**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	40	60	100
A30004	Applied Physics	BS	3	0	0	3	40	60	100
A30503	Data Structures using C	ES	3	0	0	3	40	60	100
A30001	Communicative English	HS	3	0	0	3	40	60	100
A30301	Engineering Graphics & Computer Aided Drafting	ES	1	0	4	3	40	60	100
A30008	Applied Physics Lab	BS	0	0	3	1.5	40	60	100
A30504	Data Structures Lab	ES	0	0	3	1.5	40	60	100
A30006	Communicative English Lab	ES	0	0	3	1.5	40	60	100
A30031	Environmental Science	MC	2	0	0	0	100*	-	100*
	TOTAL		**15**	**00**	**13**	**19.5**	**320**	**480**	**800**

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

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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	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: Solution of system of linear equations, Eigen values and Eigen vectors, Quadratic forms, Functions of single variable,Roll's theorem, 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:Triple Integrals 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)

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	40	60	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

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

2. 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.

3. 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)

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	40	60	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 Namdev Kamthane,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)

A30203 – BASIC ELECTRICAL & ELECTRONICS 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 is the fundamental course for engineering students. This course is intended to enhance the technical skills in understanding of the operation and design of basic components like resistor, inductor and capacitor voltage and current sources and finally a complex DC circuits. It is also important to learn about basic principles of operations DC and AC electrical machines with their applications.

This course covers fundamental topics that are common to a wide variety of electronic engineering devices and systems. The topics include an introduction to semiconductor devices and their applications. The course creates the background in the physics of the compound semiconductor-based electronic devices and also prepares students to learn about oscillators and op-amps.

Course Pre/Co-requisites:

Nil

2. Course Outcomes (COs)

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

A30203.1 State the basic laws and usage of components in electric circuits.

A30203.2 Investigate DC and AC circuits using different methods and laws.

A30203.3 Analyze the principle of operation of DC machines and AC machines along with the various tests to predetermine the efficiency and regulation.

A30203.4 Understand the theory, operation and applications of semiconductor devices.

A30203.5 Determine various parameters of rectifier circuits using with and without filters.

A30203.6 Analyze and Design different oscillator circuits, op-amps and the characteristics of BJT, FET to meet the given specifications.

3. Course Syllabus

PART A : ELECTRICAL ENGINEERING

UNIT-I

INTRODUCTION TO DC & AC ELECTRICAL CIRCUITS: Basic Circuit Components, Ohm's Law, Kirchhoff's Laws, Types of Sources, Resistive Networks, Series Parallel Circuits, Star Delta and Delta Star Transformation. Principle of AC Voltages, Root Mean Square and Average Values of Alternating Currents and Voltage, Form Factor and Peak Factor.

Network Theorems: Thevenin's, Norton's, and Superposition Theorems for DC Excitations.

Two Port Networks: Two Port Network Parameters – Impedance, Admittance, Transmission and Hybrid Parameters.

UNIT-II

DC MACHINES:

D.C Generators: Constructional Details of DC Machines, Principle of Operation of DC Generators, E.M.F Equation in D.C Generator, Types of D.C Generators and O.C.C. of a D.C. Shunt Generator.

D.C Motors:Principle of Operation of DC Motors, Torque Equation, Speed Control of D.C. shunt motor (Armature voltage control and Field flux control). Losses and Efficiency Calculation in D.C Motor-Swinburne's Test.

UNIT-III

AC MACHINES:

1-phase Transformers: Principle of Operation, Constructional Details, E.M.F. equation, Losses and Efficiency, OC & SC Tests.

3-Phase Induction Motors: Principle of Operation, Slip, Torque (Simple Problems).

3-phase Alternators: Principle of Operation-Constructional Details-EMF Equation.

PART B: ELECTRONICS ENGINEERING

UNIT-I

INTRODUCTION TO SEMICONDUCTOR DEVICES:

Semiconductor Physics: Atomic structure, energy bands, types of semiconductors, drift and diffusion Currents.

Semiconductor Devices: The P-N junction diode- forward bias, reverse Bias, volt-ampere characteristics, applications of diode.Diode as a rectifier- half wave rectifier, full wave rectifier, bridge rectifier, use of filters in electronic circuits. Zenerdiode-VI characteristics.

UNIT-II

TRANSISTOR CHARACTERISTICS (BJT & FET):

Bipolar Junction Transistor (BJT): Types, operation of NPN and PNP transistors, configurations- CB, CE and CC configurations and their input and output characteristics.

Field Effect Transistor (FET): Junction Field Effect Transistor (JFET)-construction,operation, VI characteristics,comparison of BJT and FET. MOSFET-Enhancement and Depletion MOSFET.

UNIT-III

OSCILLATORS AND OP-AMPS:

Oscillators: Types, Barkhausencriteria, Hartley and Colitt's oscillators, RC phase shift oscillator.

Operational Amplifiers (Op-Amps): Symbol, characteristics of an ideal Op-Amp, basic forms of Op-Amps- inverting &non-inverting amplifiers, applications of Op-Amps.

4. Books and Materials

Text Book(s):

1. M.S.Sukhija, T.K.Nagsarkar,*Basic Electrical and Electronics Engineering*, Oxford University Press, 1st Edition, 2012.
2. S.K Bhattacharya,*Basic Electrical and Electronics Engineering*, Pearson Education, 2012.
3. J.B. Gupta, *Electronic Devices and Circuits*, 3rd Edition, S.K. Kataria& Sons, 2008.

Reference Book(s):

1. M.S.Naidu and S. Kamakshiah,*Basic Electrical and Engineering*, Tata McGraw Hill, 3rd Edition, 2009.
2. Hughes,*Electrical and Electronic Technology*,Pearson Education.
3. J. Millman, C. Halkias, *Electronic Devices and Circuits*, TMH, 4th edition, 2010.

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	40	60	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 of aL-fitfromthegivenM.SFlatmaterialpiece.
2. **FittingTrade–**Making of aSquare joint fromthegivenM.SFlatmaterialpiece.
3. **CarpentryTrade–**Making of acrosslapjointasperspecification.
4. **CarpentryTrade-**Tomakea dovetail jointasperspecification.
5. **TinSmithy–**Making of an openscoopwiththegivensheetmetal
6. **TinSmithy–**Making of asquare tin withthegivensheetmetal
7. **Foundry:**Preparation of asandmouldusingasinglepiecepattern
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 two Two- way switches

12. **House Wiring:** Staircase-wiring
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 bench-wise
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)

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	40	60	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

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	40	60	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 nonmaterial's 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)

A30204 – BASIC ELECTRICAL AND ELECTRONICS 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

2. Course Description

Course Overview

This course is designed to provide students with fundamental concepts of Electrical Circuits and Electrical Machines for lab experience. Verification of Thevenin's, Norton's &Super Position theorems and open and short circuit parameters and also determinethe efficiency of DC & AC machines.

This course is designed to provide students with fundamental concepts of Electronic Devices for lab experience.Analysis of V-I characteristics of diodes, BJT and FET.Study of operation of rectifiers with & without filters.

Course Pre/Co-requisites:

Nil

3. Course Outcomes (COs)

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

A30204.1 Practically verify Superposition,Thevenin's, Noton's theorems and Open and Short circuit parameters.

A30204.2 Predetermine the Efficiency of a given DC Shunt Machine (i) while working as a Motor and (ii) while working as a Generator by using Swinburne's test.

A30204.3 Predetermine the Efficiency and Regulation at any given load and Power Factor of a transformer by using OC & SC tests.

A30204.4 Analyze the V-I characteristics of P -N Junction Diode and Zener Diode.

A30204.5 Analyze the input and output characteristics of BJT, Common Source Configuration Output and Transfer Characteristics of JFET.

A30204.6 Determine the ripple content present in half-wave and full-wave rectifiers using with and without filters.

4. Course Syllabus

PART – A

BASIC ELECTRICAL ENGINEERING LABORATORY

(Any Six Experiments)

1. Verification of Superposition Theorem.
2. Verification of Thevenin'sand Norton's Theorem.
3. Determination of Open circuit and Short circuit parameters of two – port network.
4. Swinburne's Test on DC Shunt Machine (Predetermination of Efficiency of a Given DC Shunt Machine Working as Motor and Generator).
5. Brake Test on DC Shunt Motor. Determination of Performance Characteristics.
6. OC & SC Tests on Single-Phase Transformer (Predetermination of Efficiency and Regulation at any given load and Power Factor).
7. Open circuit characteristics of DC Shunt Generator and determination of critical field resistance and critical speed.

PART – B

BASIC ELECTRONICS LABORATORY

(Any Six Experiments)

1. P-N Junction Diode and Zener Diode Volt-Ampere Characteristics.
2. Half-Wave Rectifier- a) Without Filter b) With Capacitor Filter.
3. Full-Wave Rectifier- a) Without Filter b) With Capacitor Filter.
4. Bipolar Junction Transistor in CE Configuration-Input and Output Characteristics,
5. Junction field effect Transistor in Common Source Configuration- Output and Transfer Characteristics.
6. Frequency of Oscillation of Hartley and Colpitt's Oscillator.
7. Verification of Logic Gates- AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR

4. Books and Materials

Text Book(s):

1. V. N. Mittle and ArvindMittle ,*Basic Electrical Engineering*,McGraw Hill (India) Pvt. Ltd., 2nd Edition, 2005.
2. T.K.Nagsarkar and M.S. Sukhija, *Basic Electrical Engineering*, OxfordUniversity Press, 2nd Edition, 2011.
3. R.L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits", Pearson Publications, 9th Edition, 2006.

Reference Book(s):

1. M.S.Naidu and S. Kamakshiah,*Basic Electrical Engineering*, TataMcGraw Hill, 3rd Edition, 2009.
2. Hughes, *Electrical and Electronic Technology*,10th edition 2010,Pearson Education
3. J.B.Gupta, "Electronic Devices and Circuits", 3rd Edition, S.K.Kataria& Sons, 2008.

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

A30011 – PROBABILITY AND STATISTICS

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	60	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: Descriptive statistics and methods for data science, Probability, Probability distributions, Estimation and Testing of hypothesis, large sample tests, and Small sample tests. The mathematical skills derived from this course provides necessary base to analytical and theoretical concepts occurring in the program.

Course Pre/co requisites

- **Basic Probability**

2. Course Outcomes (COs)

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

A30011.1 Adopt correlation methods and principle of least squares, regression analysis.
A30011.2 Apply discrete and continuous probability distributions.
A30011.3 Classify the concepts of data science and its importance.
A30011.4 Interpret the association of characteristics and through correlation and regression tools.
A30011.5 Design the components of a classical hypothesis test.
A30011.6 Infer the statistical inferential methods based on small and large sampling tests.

3. Course Syllabus

UNIT-I: Descriptive statistics

Statistics Introduction, Measures of Variability (dispersion) Skewness Kurtosis, correlation, correlation coefficient, rank correlation, principle of least squares, method of least squares, regression lines, regression coefficients and their properties.

UNIT-II: Probability

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

UNIT-III: Probability distributions

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

UNIT-IV: Estimation and Testing of hypothesis, large sample tests

Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of

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

UNIT-V: Small sample tests

Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes.

4. Books and Materials

Textbooks:

1. Miller and Freunds, *Probability and Statistics for Engineers,*7/e, Pearson, 2008.
2. S.C. Gupta and V.K. Kapoor, *Fundamentals of Mathematical Statistics,* 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:

1. S. Ross, *A First Course in Probability,* Pearson Education India, 2002.
2. W. Feller*, an Introduction to Probability Theory and its Applications*, 1/e, Wiley, 1968.

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	40	60	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

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

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

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

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

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.

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	40	60	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/Co-requisites

- 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, go to*, 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 Data Structures With Applications, TMH

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	40	60	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 Out comes (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	40	60	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

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

UNIT III

Projections of Lines: Projections 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 views to Orthographic Views.

PART –B (PRACTICE ONLY)

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)

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	40	60	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
A30008.5	Evaluate the acceptance angle of an optical fiber and numerical aperture
A30008.6	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.

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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	40	60	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/Co-requisites

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.

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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	40	60	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 to face 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

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3. Course Syllabus

List of topics to be covered:

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

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.

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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*	0	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 -1: 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 – 2: 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 -3: 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 -4: 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 -5: 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.

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III SEMESTER (II YEAR)									
	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A30019	ManagerialEconomics &Financial Analysis	HS	3	0	0	3	40	60	100
A30507	Object Oriented Programmingthrough Java	PC	3	0	0	3	40	60	100
A33301	Introduction to Machine Learning	PC	3	0	0	3	40	60	100
A30018	Numerical Methods	BS	3	0	0	3	40	60	100
A30421	Digital Electronics	ES	3	0	0	3	40	60	100
A30510	Object Oriented Programming through Java Laboratory	PC	0	0	3	1.5	40	60	100
A33302	Machine Learning Laboratory	PC	0	0	3	1.5	40	60	100
A30422	Digital ElectronicLaboratory	ES	0	0	3	1.5	40	60	100
A30511	Skill OrientedCourse-I	SC	1	0	2	2	40	60	100
A30032	Universal Human Values	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 code	SC	Course Title
A30511	Skill Oriented Course-I	Animation Design
		Android Application Development
		Sentiment Analysis

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

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 inter relationship 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.

5. Reference Book(s)

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

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

COURSE STRUCTURE

A3050 –OBJECT ORIENTED PROGRAMMING THROUGH 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:

A30507.1 Apply object oriented concepts for solving general purpose problems

A30507.2 Use inheritance, user defined packages and interfaces for code reusability

A30507.3 Apply exception handling and multithreading for robust and efficient application development

A30507.4 Implement collection frameworks to store and retrieve dataefficiently

A30507.5 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)

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

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COURSE STRUCTURE

A33301 –INTRODUCTION TO MACHINE LEARNING (IML)

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 goal of this course is to give foundation in machine learning and basic concepts used in the design of classification, prediction models. It includes different machine learning algorithms and methods. In addition, it helps to apply the appropriate machine learning technique for classification, pattern recognition and optimization and decision problems.

Course Pre/co requisites

A30011-Probability and Statistics

2. Course Outcomes (COs)

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

A33301.1:Understand Machine Learning Models and Python Stack for Data Analysis.

A33301.2:Perform Data Preprocessing techniques in Machine Learning

A33301.3:Build Simple and Multiple Linear Regression Models

A33301.4: Understand Classification Technique and Decision Tree Learning.

A33301.5 :Illustrate K-Means and Hierarchical Clustering Algorithms.

A30506.5 Build GUI applications using swings for user interface design

3. Course Syllabus

UNIT I

Introduction: Introduction To Machine Learning, Types of Machine Learning Systems, Introduction to Analytics and Machine Learning, Why Machine Learning? Framework for Developing Machine Learning Models, Why Python? Python Stack for Data Science.

UNIT II

Data Preprocessing for Machine Learning: Working with Numpy and Pandas, Loading Data files, Understanding Data with Statistics, Understanding Data with Visualization, Preprocessing Data, Data Feature Selection.

UNIT III

Linear Regression: Simple Linear Regression, Steps in Building a Regression Model, Building Simple Linear Regression Model, Model Diagnostics, Multiple Linear Regression.

UNIT IV

Classification Problems: Classification Overview, Binary Logistic Regression, Credit Classification, Gain Chart and Lift Chart, Decision Tree Classification , K-Nearest Neighbour Classifier

UNIT V

Clustering: Overview, How Does Clustering Work? K-Means Clustering, Creating Product Segments Using Clustering, Hierarchical Clustering.

4.Books and Materials

Text Book(s)

1. Machine Learning using Python by Manaranjan Pradhan and U Dinesh Kumar Wiley 2019

Reference Book(s)

1. Introduction to Machine learning with python by Andreas C.Muller & Sarah Guido O'Reilly 2017

2. Ethem Alpaydin, "Introduction to Machine Learning", The MIT Press,3e,2014

Web References:

1. https://www.geeksforgeeks.org/introduction-machine-learning/

2. https://www.coursera.org/learn/machine-learning-with-python

3. Machine Learning with python Tutorial Point

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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.

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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, binary codes, 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 slave JK 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, twistedring 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, PearsonEducation/PHI,India, 2008
2) Thomas L. Floyd 2006, *Digital fundamentals*, 9th edition, Pearson Education International, 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, 20

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

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 retrievedata

A30508.5 Design user interface using swings

3. Course Syllabus

Lab Experiment:

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. Using 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.

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

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 Description

Course 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 willbe 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 MaterialsText

Book(s)

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

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COURSE STRUCTURE

A30510– ANDROID APPLICATION DEVELOPMENT

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 aim of this course is to learn about Android based mobile devices types and modern mobile Android operating systems. The students learn about systems for mobile application distribution and mobile design principles. This course utilizes rapid prototyping techniques to design and develop sophisticated mobile interfaces.

Course Pre/corequisites

This course has no pre/co-requisites.

2. Course Outcomes (COs)

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

A30510.1 Understand the different types of mobile devices.

A30510.2 Learn how to apply Android Operating System on mobile.

A30510.3 They can understand the systems mobile application distribution.

A30510.4 Implementation of mobile design principles.

A30510.5 Implementation of prompt prototyping techniques to design and develop mobile interfaces

3. Course Syllabus

List of Experiments:

1. **INTRODUCTION:** Introduction to Mobile Computing and Android Development Environment.
2. **FACTORS IN DEVELOPING MOBILE APPLICATIONS:** Introduction to Mobile Software Engineering, Frameworks andtools, Introduction to GenericUI Development.
3. **APPLICATINS UIS:** Introduction to UIS and Mobile Applications, Text-to-Speech Techniques, Designing the Right UI, Multichannel and Multimodal UIS
4. **INTENTS AND SERVICES:** Introduction to Android Intents and Services, Characteristics of Mobile Applications and Successful Mobile Development.
5. **STORING AND RETRIEVINGDATA:** Synchronization and Replication of Mobile Data ,

Getting the Model Right Android Storing and Retrieving Data , Working with a Content Provider

4. Laboratory Equipment/Software/Tools Required

1. Amazon Web Services (AWS)
2. Microsoft Azure

5. Books and Materials

1. Beginning Android programming with android studio 4th edition, J. F. DiMarzio, Published by John Wiley & Sons, Inc.

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COURSE STRUCTURE
A33302– Machine Learning 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

Course Outcomes :At the end of the course the student will be able to
CO1: Apply Numpy and Pandas on Data Files
CO2: Use Descriptive and Data Visualization techniques
CO3: Implement Simple and Multiple linear Regression Models
CO4: Apply Classification and Clustering techniques

List of Experiments
1. Working with Numpy.
2. Working with Pandas.
3. Perform Data Summarization Techniques.
4. Perform Data Visualization
5. Apply Machine Learning Preprocessing techniques
6. Build Simple Linear Regression Model on a given Dataset
7. Build Multiple Linear Regression on a given Dataset
8. Implement Logistic Regression Model
9. Implementation of Decision Tree Learning
10. Implementation of K-Means Clustering
Books and Materials
1. https://www.geeksforgeeks.org/introduction-machine-learning/
2. https://www.coursera.org/learn/machine-learning-with-python
3. Machine Learning with python Tutorial Point

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COURSE STRUCTURE

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.

2. Course Pre/Co-requisites:

The course has no specific pre/co-requisites

3. 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 intheir 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

4. Course Syllabus

UNIT – I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

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

7. 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:

c) 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 MaterialsText

Book:

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

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

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IV SEMESTER

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

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
A30016	Discrete Mathematics	BS	3	0	0	3	40	60	100
A30521	Artificial Intelligence	PC	3	0	0	3	40	60	100
A30508	Database Management Systems	PC	3	0	0	3	40	60	100
A30514	Operating Systems	PC	3	0	0	3	40	60	100
A30515	Software Engineering	PC	3	0	0	3	40	60	100
A30523	Artificial Intelligence Laboratory	PC	0	0	3	1.5	40	60	100
A30509	Database Management Systems Laboratory	PC	0	0	3	1.5	40	60	100
A30518	Operating Systems Laboratory	PC	0	0	3	1.5	40	60	100
A30519	Web Designing	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 hour's 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 (AUTONOMOUS)

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

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.

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COURSE STRUCTURE

A30521 – 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	40	60	100

1. Course Description

Course Overview

The aim of this course is to create computer programs that can solve problems and achieve goals like humans would. This course covers problem solving, logical reasoning, planning, knowledge representation and machine learning concepts. In this course, the students are acquainted with the fundamental knowledge for understanding AI and also the basics of designing intelligent agents that can solve general purpose problems. This course helps the students to choose their career path in trending Artificial Intelligence related technologies.

Course Pre/corequisites

A30011-Probability and Statistics
A30014-Formal Languages and Automata Theory

2. Course Outcomes (COs)

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

A30521.1 Understand the fundamental concepts of Artificial Intelligence.

A30521.2 Solve problems by applying a suitable search method.

A30521.3 Solve problems by applying the heuristic search method.

A30521.4 Understand constraint satisfaction problems.

A30521.5 Understand the Knowledge Representation techniques.

3. Course Syllabus

UNIT-I

Introduction: What Is AI? Risk and benefits of AI, Intelligent Agents: Agents and Environments, GoodBehavior: The Concept of Rationality, The Nature of Environments and the Structure of Agents.

UNIT-II

Solving Problems by Searching: Problem-Solving Agents, Example Problems, Searching for Solutions.Uninformed Search Strategies: BFS, DFS, Depth –limited search, IDA, Bidirectional search.

UNIT-III

Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Memory-bounded heuristicsearch, learning to search better. Heuristic Functions.

UNIT-IV

Constraint satisfaction problem: Defining Constraint Satisfaction Problems, Constraint Propagation: Inference in CSPs, Backtracking Search for CSPs, Backtracking Search for CSPs, The Structure of Problems.

UNIT-V

Knowledge Representation: Ontological Engineering, Categories and Objects, Events, Mental

Objects andModal Logic, Reasoning Systems for Categories, Reasoning with Default Information.

4. Books and Materials

Text Book(s)

1. RussellStuart, and Peter Norvig. "Artificial intelligence: a modern approach." (2002).

Reference Book(s)

1. Artificial Intelligence, Ritch & Knight, TMH
2. Artificial Intelligence, Saroj Kaushik.
3. Introduction to Artificial Intelligence, Philip C Jackson
4. Artificial Intelligence: The Basics, Kevin Warwick

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COURSE STRUCTURE

A35082 – 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	30	70	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:

A30508.1 Apply suitable data model for given application

A30508.2 Construct optimized SQL queries to solve real time problems

A30508.3 Apply suitable normal form to eliminate data redundancy

A30508.4 Use suitable transaction model to avoid Deadlock

A30508.5 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.

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COURSE STRUCTURE

A30514– 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:

A30514.1	Apply the basic principles of Operating Systems in system programming
A30514.2	Apply the process synchronization concepts in multiprogramming environment
A30514.3	Solve the memory management problems with paging and segmentation techniques
A30514.4	Design algorithmic strategies to handle deadlock problems
A30514.5	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

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

COURSE STRUCTURE

A30515 – 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:

A30515.1 Understand the various phases of software development life cycles and software Requirements.

A30515.2 Possess necessary skills to elicit the requirements of a software system and to create well written software documentation involving appropriate system models.

A30515.3 Design, implement and evaluate a computer based system, process, component or program to meet desired needs within realistic constraints specific to the field

A30515.4 Construct software projects by integrating components with appropriate user interface

A30515.5 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.

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

COURSE STRUCTURE

A30523 – 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	40	60	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 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/corequisites

1. A30014- Formal Languages and Automata Theory
2. A35023 - Artificial Intelligence

2. Course Outcomes (COs)

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

A30523.1 Execute statistical problems to produce appropriate solutions

A30523.2 Categorize the problem for selection of an appropriate algorithm

A30523.3 Compare computational complexity of AI problems for better efficiency

A30523.4 Demonstrate various AI algorithms based on empirical and theoretical proofs for performancestatistics

3. Course Syllabus

1. Write a Program to implement Breadth First Search
2. Write a Program to implement Depth First Search
3. Write a Program to implement A* search
4. Write a program to implement Crypt arithmetic using Constraint satisfaction problem
5. Write a program to implement Hill Climbing Search
6. Write a program to implement 8-Puzzle game
7. Write a program to implement N-Queens problem
8. Write a program to Blocks World
9. Write a program to implement Chatbot application
10. Write a programto implement water Jug Problem

4. Laboratory Equipment/Software/Tools Required

Open source scripting language- Python

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*, OxfordUniversity Press, 2012.

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

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 paidemployees**.**
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 betweenthe 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.
Analyze the data required.

1. Normalize the attributes.

Create the logical data model using E-R diagrams.
Create tables andgenerate 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.

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

COURSE STRUCTURE

A30518– 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

2. 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

3. Course Outcomes (COs)

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

A30518.1 Apply appropriate CPU scheduling algorithm for the given problem.

A30518.2 Perform resource management for optimal utility of CPU.

A30518.3 Implement algorithms handling deadlock problems

A30518.4 Implement the concepts of secured file system for confidentiality and authentication.

A30518.5 Apply threading concepts to handle concurrency.

4. 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 SJFscheduling 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 theprocesses 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, Eighthedition, John Wiley.
2. Operating Systems: Internals and Design Principles, Stallings, Sixth Edition–2009, PearsonEducation
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.

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

COURSE STRUCTURE

A30519– WEB DESIGNING

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**
2. **Course Overview**

This course makes the students to practice the principles of creating an effective web page and learn the language of the web with HTML and CSS. It Develop skills in analysing the usability of a web site and how to plan and conduct user research related to web usability.

Course Pre/corequisites

A30509 Web Technologies

3. Course Outcomes (COs)

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

A30519.1	Apply the principles of creating an effective web page.
A30519.2	Apply the elements of design with regard to the web.
A30519.3	Create the language of the web: HTML and CSS.
A30519.4	Develop skills in analyzing the usability of a web site.
A30519.5	Understand how to plan and conduct user related to web usability.

4. Course Syllabus

1. **BASICS IN WEB DESIGN**: Brief History of Internet, What is World Wide Web, Why create aweb site and Standards, Public demand requirement.
2. **WEB DESIGN PRINCIPLES**: Basic principles involved in developing a web site, PlanningProcess, rules of web designing, Page design, Home Page Layout and Design Concept.
3. **INTRODUCTION TO HTML**: Introduction to HTML , HTML Documents, Basic structure of anHTML document , Creating an HTML document ,Mark up Tags and Heading-Paragraphs
4. **INTRODUCTION TO ELEMENTS OF HTML**: Working with Text, Working with Lists, Tables andFrames Working with Hyperlinks, Images and Multimedia, Forms and controls.
5. **INTRODUCTION TO CASCADING STYLE SHEETS**: Concept of CSS , Creating Style Sheet , CSSProperties , CSS Styling(Background, Text Format, Controlling Fonts) and block elements and objects ,Lists and Tables CSS Id and Class ,Box Model

5. Laboratory Equipment/Software/Tools Required

Dream Weaver, MySQL or Equivalent, Apache Server, WAMP/XAMPP

6. Books and Materials

Text Book(s)

1. Deitel and Deitel and Nieto, *Internet and World Wide Web - How to Program*‖,Prentice Hall, 5th Edition, 2015.

Reference Book(s)

1. Chris Bates, *Web Programming – Building Intranet Applications*, 3rd Edition, WileyPublications, 2014.

G.Pullaiah College of Engineering and Technology (Autonomous)

Department of Computer science and Engineering – Artificial Intelligence and Machine Learning

VSEMESTER(IIIYEAR)									
Course Code	Title of the Course	Category	Periods Per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A33503	Computer Networks	PC	3	0	0	3	40	60	100
A33118	Natural Language Processing	PC	3	0	0	3	40	60	100
A30512	Design and Analysis of Algorithms	PC	3	0	0	3	40	60	100
	Open Elective-I	OE	2	0	0	3	40	60	100
	Professional Elective-I	PE	3	0	0	3	40	60	100
A33121	Natural Language Processing Lab	PC	0	0	3	1.5	40	60	100
A30516	Design and Analysis of Algorithms Lab	PC	0	0	3	1.5	40	60	100
A30513	Web technologies	SC	1	0	2	2	40	60	100
A30034	Gender Sensitization	MC	2	0	0	0	100*	0	100*
A30532	SummerInternship2Months (Mandatory)		0	0	0	1.5	100	0	100
	TOTAL		17	01	10	21.5	420	480	900

Professional Electives

Professional Elective–1	
Course Code	Title of the Course
A30551	Data mining
A30552	Image processing
A30559	Cyber security and Privacy
A30560	Social Network Analysis

VISEMESTER(IIIYEAR)									
Course Code	Title of the Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P	C	Internal	External	Total
A30530	Big Data Analytics	PC	2	1	0	3	40	60	100
A30526	Cloud computing	PC	3	0	0	3	40	60	100
A30531	Data Visualization	PC	3	0	0	3	40	60	100
	Professional Elective-II	PE	3	0	0	3	40	60	100
	Open Elective-II	OE	3	0	0	3	40	60	100
A30529	Cloud Computing Laboratory	PC	0	0	3	1.5	40	60	100
A30532	Big Data Analytics Laboratory	PC	0	0	3	1.5	40	60	100
A30533	Data Visualization Lab (Using Power BI / Tableau etc.,) /	PC	0	0	3	1.5	40	60	100
A30021	Professional English and communication skills laboratory	SA	1	0	2	2	40	60	100
A30036	Indian Constitution andmulticulturalism	MC	2	0	0	0	100*	0	100*
		TOTAL	17	01	08	21.5	360	540	900

Professional Electives

Professional Elective–2	
Course Code	Title of the Course
A33128	Computer Vision
A30527	DevOps
A33137	Recommender Systems
A30558	Design Patterns

Open Electives

Course Code	Title of the Course	L-T-P	Credits	Offered by
A30181	Basic Civil Engineering	3-0-0	3	CE
A30182	Building Planning and Construction	3-0-0	3	CE
A30183	Disaster Management	3-0-0	3	CE
A30184	Water Resources Conservation	3-0-0	3	CE
A30281	Fundamentals of Electrical Engineering	3-0-0	3	EEE
A30282	Renewable Energy Sources	3-0-0	3	EEE
A30283	Electrical Measuring Instruments	3-0-0	3	EEE
A30284	Control Systems Engineering	3-0-0	3	EEE
A30381	Optimization Techniques	3-0-0	3	ME
A30382	Mechanical Technology	3-0-0	3	ME
A30383	Introduction to Automobile Systems	3-0-0	3	ME
A30481	Basic Electronics	3-0-0	3	ECE
A30482	Introduction to Communication Systems	3-0-0	3	ECE
A30483	Fundamentals of IoT	3-0-0	3	ECE
A30484	Introduction to Embedded systems	3-0-0	3	ECE
A30485	CISCO Networking	3-0-0	3	ECE
A30581	Basic Data Structures	3-0-0	3	CSE
A30582	Fundamentals of DBMS	3-0-0	3	CSE
A30583	Basics of Software Engineering	3-0-0	3	CSE
A30584	Python for Everyone	3-0-0	3	CSE
A30585	Computer Organization and Operating Systems	3-0-0	3	CSE
A30586	Fundamentals of Artificial Intelligence and Machine Learning	3-0-0	3	CSE
A30587	Fundamentals of Web Technologies	3-0-0	3	CSE
A30588	Introduction to Java Programming	3-0-0	3	CSE
A30081	Research Methodology	3-0-0	3	H&S
A30082	Intellectual Property Rights	3-0-0	3	H&S
A30083	National Service Scheme	3-0-0	3	H&S
A30084	Yoga	3-0-0	3	H&S
A30085	Design Thinking	3-0-0	3	H&S
A30086	Management science	3-0-0	3	H&S
A30087	Entrepreneurship Development	3-0-0	3	H&S

COURSE STRUCTURE

A33503– COMPUTER NETWORKS

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 introduced as a professional core offering insight into important aspects of computer networks. It covers the functionality of each layer in computer networks, besides highlighting the flow of control and congestion control algorithms. This course helps the learner in selecting a domain path leading to cyber security specialization.

2. Course Outcomes (COs)

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

A33503.1 Apply the networking concepts in configuring the systems

A33503.2 Illustrates error handling mechanism in data link layer

A33503.3 Analyze the routing algorithms in finding the shortest path

A33503.4 Apply transport protocols in network communications

A33503.5 Implements domain name service and network security in the communication segment.

3. Course Syllabus

UNIT-I

Introduction: Network hardware, Network software, Reference models-OSI,TCP/IP, examples of networks-the internet, 4G mobile phone networks, RFID and sensor networks.

Physical Layer: Guided Transmission, Wireless Transmission, Public switched telephone networks Structure of the telephone system, FDM, TDM, Switching.

UNIT-II

Data Link Layer: Design issues, error detection and correction, elementary data link protocol, sliding window protocols. Medium access sub layer: the channel allocation problem, multiple access protocols, Ethernet, wireless LANS.

UNIT-III

Network Layer: Network layer design issues, routing algorithms-shortest path routing, flooding, hierarchical routing, broadcast, multicast, distance vector routing, link state routing.

Congestion Control: Congestion control algorithms, Quality of service, application requirements, Traffic Shaping, the network layer in the internet, IPV4 protocol, IP- addresses, Internet control protocols, IPV6.

UNIT-IV

Transport Layer: Transport services, elements of transport protocols and the internet transport Protocols TCP and UDP protocols.

UNIT-V

Domain Name System: The DNS name space, domain resource records, name servers, Network security: introduction to cryptography, DES—the Data Encryption Standard, RSA.

4. Books and Materials

Text Book(s)

1. Andrew S. Tanenbaum, David J, *Computer Networks*, Pearson Education /PHI, 5th edition 2016.

Reference Book(s)

1. Behrouz A.Forouzan,*DataCommunicationsandNetworking,*TMH,4thedition2017.
2. S.Keshav*, An Engineering Approach to Computer Networks,* Pearson Education, 2nd edition 2014.

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COURSESTRUCTURE

A33118 - Natural Language Processing

HoursPerWeek			HoursPerSemester			Credits	AssessmentMarks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	4	40	60	100

1. Course Description

Course Overview

Natural language processing (NLP) presents a solution to this problem, offering a powerful tool for managing unstructured data. IBM defines NLP as a field of study that seeks to build machines that can understand and respond to human language, mimicking the natural processes of human communication. Read on as we explore the role of NLP in the realm of artificial intelligence.

CoursePre/corequisites

A30528-Machine learning techniques

2. CourseOutcomes(COs)

Aftercompletionof thecourse, thelearnerwillbeableto:

CO1: Understand the logic behind Natural languages

CO2: Understand the significance of syntax and semantics of natural languages

CO3: Process the Natural languages

CO4: Verify the syntax and semantics of languages

CO5: Design new natural languages

3. CourseSyllabus

UNIT-I

IntroductiontoNaturallanguage

The Study of Language, Applications of NLP, Evaluating Language Understanding Systems,Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English Syntax.

UNIT-II

Grammars and Parsing

Grammars and Parsing- Top- Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.

UNIT-III

Grammars for Natural Language:

Grammars for Natural Language, Movement Phenomenon in Language, Handling questions in Context Free Grammars, Hold Mechanismsin ATNs, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.

UNIT-IV

Interpretation and Modelling

Semantic Interpretation-Semantic & Logical form, Word senses & ambiguity, the basic logical form language, encoding ambiguity in the logical Form, Verbs & States in logical form, Thematic roles, Speech acts &embedded sentences, Defining semantics structure model theory.

UNIT-V

Machine Translation and Multilingual Information

Machine Translation Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches, Current Status. Anusaraka or Language Accessor: Background, Cutting the Gordian Knot, Approaches to Summarization, Evaluation, How to Build a Summarizer,

Competitions and Datasets

BooksandMaterials

TextBook(s):

1. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.
2. Multilingual Natural Language Processing Applications: From Theory to Practice-Daniel M.Bikel and ImedZitouni, Pearson Publications.
3. Natural Language Processing, A paninian perspective, Akshar Bharathi, Vineet Chaitanya, Prentice –Hall of India.

Reference Books:

1. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.

2. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2nd Edition, Prentice Hall, 2008.

3. Manning, Christopher and Henrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999. Online Learning Resources: http://peterindia.net/AILinks.htm

COURSE STRUCTURE

A30512 – 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:

A30512.1 Analyze the efficiency of algorithm for a given problem.

A30512.2 Formulate the time order analysis for given algorithm.

A30512.3 Identify the mathematical techniques required to prove the time complexity of an algorithm.

A30512.4 Design appropriate algorithm to solve real world problems.

A30512.5 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

A30551 – DATA MINING

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 introduced to drive the students to reach the depth of data science with warehousing and mining concepts. It covers data pre-processing, mining frequent patterns, associations and correlations, classification and prediction, and cluster analysis**.** In addition to this it paves way for machine learning algorithms. This helps the student to choose the career path in data science and architect the data for better decision making.

Course Pre/corequisites

A35006-Database Management Systems

2. Course Outcomes (COs)

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

A30551.1 Apply the principles of business intelligence in the commercial segment

A30552.2 Make use of pre-processing techniques for data organization

A30553.3 Implement association, clustering and rule based mining for Market based analysis

A30554.4 Analyze the data mining classification technique for data differentiation

A30555.5 Design the unsupervised clustering algorithms for data analysis

3. Course Syllabus

UNIT-I

Data Mining: Fundamentals of data mining, data mining functionalities, classification of data mining systems, data mining task primitives.

UNIT-II

Data Pre Processing: Descriptive data summarization, data cleaning, data integration and transformation, data reduction, data discretization and concept hierarchy generation.

UNIT-III

Mining Frequent Patterns, Associations and Correlations: Efficient and scalable frequent item set mining methods, association rules, and correlation analysis

UNIT-IV

Classification and Prediction: Decision tree induction, various classification methods, accuracy and error measures, ensemble methods.

UNIT-V

Cluster Analysis: Types of data in cluster analysis, categorization and partitioning, hierarchical, density-based, grid-based, model-based clustering methods, outlier analysis.

4. Books and Materials

Text Book(s)

1. Jiawei Han, Michel Kamber, *Data Mining Concepts and Techniques*, 3/e, Elsevier, 2019.

Reference Book(s)

1. Alex Berson, Stephen Smith, *Data Warehousing Data Mining & OLAP*, TMH.

2. K.P.Soman, S.Diwakar, V.Ajay, *Insight into Data Mining*, PHI, 2008.

COURSE STRUCTURE

A30552 - IMAGE PROCESSING

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

In this course students will learn digital image processing techniques including representation, sampling and quantization, image acquisition, imaging geometry, image transforms, image enhancement, image smoothing and sharpening, and image restoration.

2. Course Outcomes (COs)

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

A30552.1 Interpret fundamental concepts of digital and colour image processing.

A30552.2 Exemplify image enhancement.

A30552.3 Analyze the various terminologies involved in image segmentation like edge, boundary detection etc. Assess image compression techniques for digital images.

A30552.4 Summarize segmentation techniques for digital images.

UNIT-I:

INTRODUCTION TO DIGITAL IMAGE PROCESSING

Introduction: Digital image representation, Fundamental steps in image processing, Elements ofdigital image processing, Elements of visual perception, Simple image model, Sampling andQuantization, Basic relationships between pixels, Image transformations.

Applications: Medical imaging, Robot vision, Character recognition, Remote sensing.

UNIT–II:

IMAGE ENHANCEMENT

Need for image enhancement, Point processing, Histogram processing, Spatial filtering-Smoothing and Sharpening.

UNIT-III:

COLOR IMAGE PROCESSING

Colour fundamentals, Colour models, Color transformations, Pseudo colour image processing, Full colour image processing.

UNIT–IV:

IMAGE COMPRESSION

Redundancies, Fidelity criteria, Image compression model, Lossless compression: Huffmancoding, Arithmetic coding. Lossy compression: Lossy Predictive Coding, JPEG CompressionStandard.

UNIT–V:

IMAGE SEGMENTATION

Detection of discontinuities: point, line and edge detection, Edge linking and Boundary.

Detections: Local Processing, Global processing via Hough transform, Thresholding, Region oriented

segmentation: Region growing, Region splitting and merging.

4.Books and Materials

Text Book(s)

1. Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing”, 3rd Edition, Pearson Education, 2011.

Reference Book(s)

1. S Jayaraman, S Esakkirajan and T Veerakumar, “Digital Image Processing”, TMH, 2011.

2. S. Sridhar, “Digital Image Processing”, 2nd Edition, Oxford Publishers, 2016.

COURSE STRUCTURE

A30559-CYBER SECURITY AND PRIVACY

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 introduced as a professional core offering insight into important aspects of cyber security. It covers the basic concepts of CIA, vulnerability, threat, risk, attack, compromise, and control. This course helps the learner in selecting a domain path leading to cyber security specialization.

2. Course Outcomes (COs)

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

A33503.1 Explain the fundamental concepts of the cyber security discipline

A33503.2 Identify strengths and weaknesses, modes, implementation issues and applications of different crypto protocols, techniques and tools including symmetric and asymmetric algorithms, encryption and hashing, PKI, etc.

A33503.3 Identify potential cyber attacks, as well as cyber defense tools, methods and components to repel attacks

A33503.4 Explain principles of cybersecurity and how they should be applied in the development of security mechanisms and policies

A33503.5 Describe the security implications of various components in a computer system such as, hardware, OS, applications, network, and the user.

3. Course Syllabus

UNIT-I

Introduction: Evolution of Information Security, The Current Cyberspace Environment: Introduction to Cyber Risk, Developing Awareness of the Cyber Threat, How Digital transformation impacts cyber security, privacy and security, new cyber trends, Cyber Threat landscape

Cyber Risk Fundamentals: Why is Cyber Security important, Determining Risk, Risk Management Process, Quantitative vs Qualitative Risk Management, Risk Management Life Cycle, Frameworks and Methodologies, Risk Management Controls, Common Tools, Risk Management Assessment, Threat and Vulnerability Identification, Likelihood and Impact analysis

UNIT-II

Attacks and Defense: Malware**,** virus, worms, trojan horse, rootkit, zombie, bot, botnet, ransomware, Bug: buffer overflow, integer overflow, TOCTTOU, covert channel Security model: threat model, trust model, trusted computing base Security principles and countermeasures

UNIT-III

Introduction to Crypto: The role and property of crypto Terminology: Alice, Bob, Eve, encrypt, decrypt, cryptography, cryptanalysis Classical encryption: Caesar Cipher, ROTx, substitution cipher Symmetric encryption: DES, AES Key negotiation: DH Asymmetric encryption: RSA Hash: MD, MAC, HMAC Data authenticity and confidentiality.

UNIT-IV

Something you know, you are, and you have: password, biometrics, token. Digital signature and Kerberos Digital certificate and PKI Access policy, access control matrix, access control list, capability, RBAC

UNIT-V

Data Privacy: Data Protection and Data Privacy, Breach Response & Recovery, Cyber Crisis Management, Business Continuity Planning, Identifying Business Continuity requirements, Business Impact analysis, Planning your Continuity, BCP Components, Cost-Benefit Analysis, Availability and Reliability, Risk Evaluation, Business Consequences, Management Consulting Techniques, Industry Case Studies

4. Books and Materials

Text Book(s)

1. A.Refsdal, B. Solhaug, K. Stolen, " Cyber-Risk Management", Springer, 2015/Latest Edition.
2. E. Wheeler, "Security Risk Management", O'Reilly, 2011/Latest Edition.

Reference Book(s)

1. R. Bentham, "Cyber Risk Management: Practical Strategies to Protect your Organization from Cyber Threats", Kogan Page, 2018/Latest Edition.
2. C.J. Hodson, "Cyber Risk Management: Prioritize Threats, Identify Vulnerabilities and Apply Controls", Kogan Page, 2019/Latest Edition

COURSE STRUCTURE

A30560-SOCIAL NETWORK 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 mainly describes about social network and semantic web which are used to learn knowledge representation using ontology and also understand human behavior in social web and related communities.

2. Course Outcomes (COs)

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

A30560.1 Ability to design and develop semantic web related applications

A30560.2 Ability to represent knowledge using ontology

A30560.3 Ability to predict human behavior in social web and related communities

A30560.4 Ability to visualize social networks

Course Syllabus

Unit-I: INTRODUCTION Introduction to Semantic Web: Limitations of current Web – Development of Semantic Web – Emergence of the Social Web – Social Network analysis: Development of Social Network Analysis – Key concepts and measures in network analysis – Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities – Web-based networks – Applications of Social Network Analysis.

Unit-II: MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION Ontology and their role in the Semantic Web: Ontology-based knowledge Representation – Ontology languages for the Semantic Web: Resource Description Framework – Web Ontology Language – Modelling and aggregating social network data: State-of-the-art in network data representation – Ontological representation of social individuals – Ontological representation of social relationships – Aggregating and reasoning with social network data – Advanced representations.

Unit-III: EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS Extracting evolution of Web Community from a Series of Web Archive – Detecting communities in social networks – Definition of community – Evaluating communities – Methods for community detection and mining – Applications of community mining algorithms – Tools for detecting communities social network infrastructures and communities – Decentralized online social networks – Multi-Relational characterization of dynamic social network communities.

Unit-IV: PREDICTING HUMAN BEHAVIOR AND PRIVACY ISSUES Understanding and predicting human behavior for social communities – User data management – Inference and Distribution – Enabling new human experiences – Reality mining – Context – Awareness – Privacy in online social networks – Trust in online environment – Trust models based on subjective logic – Trust network analysis – Trust transitivity analysis – Combining trust and reputation – Trust derivation based on trust comparisons – Attack spectrum and counter measures.

Unit-V: VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS Graph theory – Centrality – Clustering – Node-Edge

Diagrams – Matrix representation – Visualizing online social networks, visualizing social networks with matrix-based representations – Matrix and Node-Link Diagrams – Hybrid representations – Applications – Cover networks – Community welfare – Collaboration networks – Co-Citation networks.

TEXT BOOKS: 1. Peter Mika, —Social Networks and the Semantic Web, First Edition, Springer 2007.
2.Borko Furht, —Handbook of Social Network Technologies and Applications, 1st Edition, Springer, 2010.

REFERENCES: 1. Guandong Xu ,Yanchun Zhang and Lin Li,-Web Mining and Social Networking – Techniques and applications, First Edition, Springer, 2011.
2. Dion Goh and Schubert Foo,-Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively, IGI Global Snippet, 2008.
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling, IGI Global Snippet, 2009.
4. John G. Breslin, Alexander Passant and Stefan Decker, -The Social Semantic Web, Springer, 2009.

COURSESTRUCTURE

A33121-NATURAL LANGUAGE PROCESSING LABORATORY

HoursPerWeek			HoursPerSemester			Credits	AssessmentMarks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	40	60	100

1. CourseDescription

CourseOverview

- The aim of the laboratory is to provide NLP techniques for text representation, semantic extraction techniques, data structures and modeling. Deep understanding of text representation techniques (such as n-grams, bag of words, sentiment analysis etc), statistics and classification algorithms.An analytical mind with problem-solving abilities.Degree in Computer Science, Mathematics, Computational Linguistics or similar field.

Course Pre/co requisites

A30528-Machine learning techniques

2. CourseOutcomes(COs)

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

CO1: Understand approaches to syntax and semantics in NLP.

CO2: Analyse grammar formalism and context free grammars

CO3: Apply the statistical estimation and statistical alignment models

CO4: Apply Rule based Techniques, Statistical Machine translation (SMT), word alignment

CO5: Have the skills (experience) of solving specific NLP tasks, which may involve programming in Python, as well as running experiments on textual data.

3. CourseSyllabus

List of cloud computing programs

1:Word Analysis.
2: Word Generation.
3: Morphology.
4: N-Grams.
5: N-Grams Smoothing
6: POS Tagging: Hidden Markov Model.
7: POS Tagging: Viterbi Decoding.
8: Building POS Tagger
9: Chunking
10: Building Chunker

4. Laboratory Equipment/Software/Tools Required

Natural language Tool Kit (NLTK)

5. BooksandMaterials

TextBook(s)

1. T1. James Allen, Natural Language Understanding, 2nd Edition, 2003, PearsonEducation.
2. T2. Natural Language Processing, A paninian perspective, Akshar Bharathi, Vineet Chaitanya, Prentice –Hall of India.

ReferenceBook(s)

1. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.

2.Natural Language Processing, A paninian perspective, Akshar Bharathi, Vineet Chaitanya, Prentice –Hall of India. Online Learning Resources/Virtual Labs: 1. Natural Language Processing in TensorFlow | Coursera

COURSESTRUCTURE

A33121-DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY

HoursPerWeek			HoursPerSemester			Credits	AssessmentMarks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	40	60	100

1. CourseDescription

CourseOverview

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/co requisites

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

2. CourseOutcomes(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.

CourseSyllabus

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 and display as 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.

6. 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

A30513- WEB TECHNOLOGIES

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 to enrich their knowledge in web technologies by applying HTML, CSS concepts in developing the web pages. It highlights the importance of client and server side scripting languages like PHP and XML. It also focuses on the web services and their importance. The learners of this course can choose their career as web developer.

Course Pre/corequisites

A30506- Object Oriented programming through Java

2. Course Outcomes (COs)

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

A30513.1 Construct a basic website using HTML and Cascading Style Sheets.

A30513.2 Build dynamic web page using Java Script objects and event handling mechanisms.

A30513.3 Develop server side programs using Servlets and Java Server Page.

A30513.4 Construct web pages in PHP to represent data in XML format.

A30513.5 Use AJAX and web services to develop interactive web applications

3. Course Syllabus

UNIT-I

Website Basics, Html 5, CSS 3, Web 2.0 9 Web Essentials: Clients, Servers and Communication – The Internet – Basic Internet protocols – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Semantic elements – Drag and Drop – Audio – Video controls - CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images –Colors – Shadows – Text – Transformations – Transitions – Animations.

UNIT-II

Client Side Programming Java Script: An introduction to JavaScript–JavaScript DOM Model-Date and Objects,-Regular Expressions- Exception Handling-Validation-Built-in objects-Event Handling DHTML with JavaScript- JSON introduction – Syntax – Function Files – Http Request –SQL.

UNIT-III

Server Side Programming Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions Session Handling- Understanding Cookies- Installing and Configuring Apache Tomcat Web Server- DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example .

UNIT-IV

PHP and XML An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions Form Validation- Regular Expressions - File handling – Cookies - Connecting to Database.XML: Basic XML- Document Type Definition- XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation.

UNIT-V

Introduction to Ajax and Web Services: AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods; Web Services: Introduction- Java web services Basics – Creating, Publishing, Testing and Describing a Web services (WSDL)-Consuming a web service, Database Driven web service from an application –SOAP.

4. Books and Materials

Text Book(s)

1. Deitel and Deitel and Nieto, *Internet and World Wide Web - How to Program*‖,Prentice Hall, 5th edition, 2015.
2. A.A. Puntambekar, *Internet Programming,* Technical publications, 2nd Edition, 2019

Reference Book(s)

1. Chris Bates, *Web Programming – Building Intranet Applications*, 3rd Edition, Wiley Publications, 2009.
2. Gopalan N.P. and Akilandeswari J., —*Web Technology*‖, Prentice Hall of India, 2011.

COURSE STRUCTURE

A30034- GENDER SENSITIZATION

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	0	100

1. Course Description

Course Overview

The main objective of this course is to develop student's sensibility with regard to issues of gender in contemporary India and to provide a critical perspective on the socialization of men and women. It also introduces students to information about some key biological aspects of genders to expose the students to debates on the politics and economics of work. This course helps the students to reflect critically on gender violence.

2. Course Outcomes (COs)

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

A30034.1 Develop a better understanding of important issues related to gender in contemporary India.

A30034.2 Sensitize to basic dimensions of the biological, sociological, psychological and legal aspects of gender.

A30034.3 Acquire insight into the gendered division of labour and its relation to politics and economics.

A30034.4 Equip to work and live together as equals

A30034.5 Develop a sense of appreciation of women in all walks of life

3. Course Syllabus

UNIT -I

UNDERSTANDING GENDER: Gender: Why should we study it Socialization: Making Women, Making Men Introduction, preparing for Woman hood, growing up Male, First lessons in Caste, Different Masculinities

UNIT -II

GENDER AND BIOLOGY: Missing Women: Sex Selection and its consequences Declining Sex Ratio, Demographic Consequences Gender Spectrum: Beyond the Binary Two or Many? Struggles with Discrimination, Additional Reading: Our Bodies, Our Health.

UNIT -III

GENDER AND LABOUR: Housework: The Invisible Labour "My Mother Doesn't Work". "Share the Load", Women's Work: Its Politics and Economics Fact and Fiction, Unrecognized and Unaccounted work

UNIT -IV

ISSUES OF VIOLENCE: Sexual Harassment: Say No! Sexual Harassment, not Eve-Teasing-Coping with Everyday Harassment Domestic Violence: Speaking Out Is Home a Safe Place? -When Women Unite [Film], Rebuilding Lives Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life….."

UNIT- V

GENDER STUDIES: Knowledge: Through the Lens of Gender Point of View, Gender and the Structure of Knowledge. Who's History? Questions for Historians and Others Reclaiming a Past, Writing other Histories.

4. Books and Materials

Text Book(s)

1. A. Suneeta, UmaBhrugubanda,Towards a world of equals: A Bilingual Textbook on gender

Reference Book(s)

1. Sen, Amartya. "More thanone Million Women are Missing." New York ReviewofBooks 37,20(20 DecembeR2090). print

VISEMESTER(IIIYEAR)									
Course Code	Title of the Course	Category	Periodsper Week			Credits	SchemeofExamination Maximum Marks		
			L	T	P	C	Internal	External	Total
A30530	Big Data Analytics	PC	2	1	0	3	40	60	100
A30526	Cloud computing	PC	3	0	0	3	40	60	100
A30531	Data Visualization	PC	3	0	0	3	40	60	100
	Professional Elective-II	PE	3	0	0	3	40	60	100
	Open Elective-II	OE	3	0	0	3	40	60	100
A30529	Cloud Computing Laboratory	PC	0	0	3	1.5	40	60	100
A30532	Big Data Analytics Laboratory	PC	0	0	3	1.5	40	60	100
A30533	Data Visualization Lab (Using Power BI / Tableau etc.,) /	PC	0	0	3	1.5	40	60	100
A30021	Professional English and communication skills laboratory	SA	1	0	2	2	40	60	100
A30036	Indian Constitution andmulticulturalism	MC	2	0	0	0	100*	0	100*
		TOTAL	17	01	08	21.5	360	540	900

Professional Electives

Professional Elective–2	
Course Code	Title of the Course
A33128	Computer Vision
A30527	DevOps
A33137	Recommender Systems
A30558	Design Patterns

Open Electives

Course Code	Title of the Course	L-T-P	Credits	Offeredby
A30181	BasicCivilEngineering	3-0-0	3	CE
A30182	BuildingPlanningandConstruction	3-0-0	3	CE
A30183	DisasterManagement	3-0-0	3	CE
A30184	WaterResourcesConservation	3-0-0	3	CE
A30281	FundamentalsofElectricalEngineering	3-0-0	3	EEE
A30282	RenewableEnergySources	3-0-0	3	EEE
A30283	ElectricalMeasuringInstruments	3-0-0	3	EEE
A30284	controlSystemsEngineering	3-0-0	3	EEE
A30381	OptimizationTechniques	3-0-0	3	ME
A30382	MechanicalTechnology	3-0-0	3	ME
A30383	IntroductiontoAutomobileSystems	3-0-0	3	ME
A30481	Basic Electronics	3-0-0	3	ECE
A30482	IntroductiontoCommunicationSystems	3-0-0	3	ECE
A30483	FundamentalsofIoT	3-0-0	3	ECE
A30484	IntroductiontoEmbedded systems	3-0-0	3	ECE
A30485	CISCONetworking	3-0-0	3	ECE
A30581	BasicData Structures	3-0-0	3	CSE
A30582	FundamentalsofDBMS	3-0-0	3	CSE
A30583	BasicsofSoftwareEngineering	3-0-0	3	CSE
A30584	PythonforEveryone	3-0-0	3	CSE
A30585	Computer OrganizationandOperatingSystems	3-0-0	3	CSE
A30586	FundamentalsofArtificialIntelligenceandMachine Learning	3-0-0	3	CSE
A30587	FundamentalsofWebTechnologies	3-0-0	3	CSE
A30588	IntroductiontoJavaProgramming	3-0-0	3	CSE
A30081	ResearchMethodology	3-0-0	3	H&S
A30082	IntellectualPropertyRights	3-0-0	3	H&S
A30083	NationalServiceScheme	3-0-0	3	H&S
A30084	Yoga	3-0-0	3	H&S
A30085	Design Thinking	3-0-0	3	H&S
A30086	Managementscience	3-0-0	3	H&S
A30087	EntrepreneurshipDevelopment	3-0-0	3	H&S

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COURSESTRUCTURE

A30530-BIG DATA ANALYTICS

HoursPerWeek			HoursPerSemester			Credits	AssessmentMarks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	4	40	60	100

Course Objectives:

- To optimize business decisions and create competitive advantage with Big Data analytics
- To learn to analyze the big data using intelligent techniques
- To introduce programming tools PIG &HIV EinHadoop echo system

Course Outcomes:

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

- Illustratebigdatachallengesindifferentdomainsincludingsocialmedia,transportation,financeand medicine
- Use various techniques for mining data stream
- Design and develop Hadoop
- Identify the characteristics of datasets and compare the trivial data and big data for various applications
- Explore the various search methods and visualization techniques

UNITI:

Introduction: Introduction to big data: Introduction to Big Data Platform, Challenges of Conventional Systems, Intelligent data analysis, Nature of Data, Analytic Processes and Tools, Analysisvs Reporting.

UNITII:

Stream Processing: Mining data streams: Introduction to Streams Concepts, Stream Data Modeland Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Oneness in a Window, Decaying Window, Real time Analytics Platform (RTAP) Applications, Case Studies-Real Time Sentiment Analysis-Stock Market Predictions.

UNITIII:

Introduction to Hadoop: History of Hadoop, the Hadoop Distributed File System, Components of Hadoop Analysing the Data with Hadoop, Scaling Out, Hadoop Streaming, Design of HDFS, Java interfaces to HDFS Basics, Developing a Map Reduce Application, How Map Reduce Works, Anatomy of a Map Reduce Job run, Failures, Job Scheduling, Shuffle and Sort, Task execution, Map Reduce Types and Formats, Map Reduce Features Hadoop environment.

UNITIV:

Frameworks and Applications: Frameworks: Applications on Big Data Using Pig and Hive, Data processing operators in Pig, Hive services, HiveQL, Querying Data in Hive, fundamentals of H Base and Zoo Keeper.

UNITV:

Predictive Analytics and Visualizations: Predictive Analytics, Simple linear regression, Multiplelinear regression, Interpretation of regression coefficients, Visualizations, Visual data analysis techniques, interaction techniques, Systems and application Competitions and Datasets

Text Books:

1. TomWhite, “Hadoop:TheDefinitiveGuide”, Third Edition,O’reillyMedia, FourthEdition,2015.
2. ChrisEaton,DirkDeRoos,TomDeutsch,GeorgeLapis,PaulZikopoulos,“UnderstandingBigData: Analytics for Enterprise Class Hadoop and Streaming Data”, McGraw Hill Publishing, 2012.
3. AnandRajaramanandJeffreyDavidUllman,“MiningofMassive Datasets”,CUP,2012

Reference Books:

1. BillFranks,“TamingtheBigDataTidalWave:FindingOpportunitiesinHugeDataStreamswith AdvancedAnalytics”,JohnWiley&sons,2012.
2. Paul Zikopoulos, DirkdeRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan,“Harness the Power of Big Data: The IBM Big Data Platform”, Tata McGraw HillPublications,2012.
3. ArshdeepBahgaandVijayMadisetti,“BigDataScience&Analytics:AHandsOnApproach“,VPT, 2016.
4. Bart Baesens, “Analytics in a BigData World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)”, John Wiley & Sons, 2014.

Software Links

1. Hadoop:http://hadoop.apache.org/
2. Hive:https://cwiki.apache.org/confluence/display/Hive/Home
3. Piglatin:http://pig.apache.org/docs/r0.7.0/tutorial.html

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COURSE STRUCTURE

A30526- CLOUD COMPUTING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	4	40	60	100

1. Course Description

Course Overview

The aim of the course is to provide insight of cloud computing architecture and its services. It includes various cloud service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). This course helps the learner to best utilize the cloud services in their domain and helps in choosing cloud computing as their profession.

Course Pre/co requisites

A35014- Operating systems
A35015-Computer Networks

2. Course Outcomes (COs)

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

A30526.1 Analyze cloud delivery models for better architecture.

A30526.2 Implement infrastructure as a service model for industrial applications.

A30526.3 Organize the cloud platform model for optimization services.

A30526.4 Develop various application software with software as service.

A30526.5 Design cloud computing reference architecture for delivery models.

3. Course Syllabus

UNIT-I

Introduction Of Delivery Models In Cloud Computing: introduction to cloud delivery models, list various cloud delivery models, advantages of delivery models in cloud, trade-off in cost to install versus flexibility, cloud service model architecture.

UNIT-II

Infrastructure as a Service (IaaS): Introduction to Infrastructure as a Service delivery model, characteristics of IaaS, architecture, examples of IaaS, applicability of IaaS in the industry.

UNIT-III

Platform as a Service (PaaS): Introduction to Platform as a Service delivery model, characteristics of PaaS, patterns, architecture and examples of PaaS, applicability of PaaS in the industry.

UNIT-IV

Software as a Service (SaaS): Introduction to Software as a Service delivery model, characteristics of SaaS, architecture, examples of SaaS, applicability of SaaS in the industry.

UNIT-V

Cloud Computing Reference Architecture (CCRA): Introduction to cloud computing reference architecture (CCRA), benefits of CCRA, architecture overview, versions and application of CCRA for developing clouds.

4. Books and Materials

Text Book(s):

1. Rajkumar Buyya, James Broberg, and Andrzej Goscinski, *Cloud Computing: Principles and Paradigms* by Wiley Press, New York, USA, 2017.

Reference Book(s):

1. Judith Hurwitz, Robin Bloor, Marcia Kaufman, Fern Halper, *Cloud computing for Dummies* (November 2016).

2. Michael J. Kavis, *Architecting the Cloud: Design Decisions for Cloud Computing Service Models* by, Wiley Press, 2016.

3. Michael J. Kavis, Gautam Shroff, *Enterprise Cloud Computing Technology Architecture Applications*, Cambridge University Press, 2013.

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COURSESTRUCTURE

A30531-DATA VISUALIZATION

HoursPerWeek			HoursPerSemester			Credits	AssessmentMarks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	4	40	60	100

Course Objectives:

- To learn different statistical methods for Data visualization.
- To learn basics of R and Python.
- To learn usage of Watson studio.
- To learn about packages Numpy, pandas and matplotlib.
- To learn functionalities and usages of Seaborn.

Course Outcomes:

At Completion of this course, students would be able to -

- Apply statistical methods for Data visualization.
- Gain knowledge on R and Python
- Understand usage of various packages in R and Python.
- Demonstrate knowledge of Watson studio.
- Apply data visualization tools on various data sets**.**

UNIT I

Introduction to Statistics :

Introduction to Statistics, Difference between inferential statistics and descriptive statistics, Inferential Statistics- Drawing Inferences from Data, Random Variables, Normal Probability Distribution, Sampling, Sample Statistics and Sampling Distributions.

R overview and Installation- Overview and About R, R and R studio Installation, Descriptive Data analysis using R, Description of basic functions used to describe data in R.

UNIT II

Data manipulation with R: Data manipulation packages, Data visualization with R .

Data visualization in Watson Studio: Adding data to data refinery, Visualization of Data on Watson Studio.

UNIT III

Python: Introduction to Python, How to Install, Introduction to Jupyter Notebook, Python scripting basics, Numpy and Pandas.

UNIT IV

Data Visualization Tools in Python- Introduction to Matplotlib, Basic plots using matplotlib, Specialized Visualization Tools using Matplotlib, Advanced Visualization Tools using Matplotlib- Waffle Charts, Word Clouds.

UNIT V

Introduction to Seaborn: Seaborn functionalities and usage, Spatial Visualizations and Analysis in Python with Folium, Case Study.

TEXT BOOKS:

1. Core Python Programming - Second Edition, R. Nageswara Rao, Dreamtech Press.
2. R Graphics Essentials for Great Data Visualization by Alboukadel Kassambara

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COURSE STRUCTURE

A33128 –Computer Vision

Professional Elective Course– 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	40	60	100

1. Course Objectives:

- The objective of this course is to understand the basic issues in computer vision and major approaches that address them.
- Students should be able to learn the Linear Filters, Segmentation by clustering, Edge detection.

Pre-requisite

2. Course Outcomes (CO):

After completion of the course, students will be able to

A33128.1 Identify basic concepts, terminology, theories, models and methods in the field of computer vision.

A33128.2 Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition.

A33128.3 Develop the practical skills necessary to build computer vision applications.

A33128.4 Exposure to object and scene recognition and categorization from images.

3. Course Syllabus:

UNIT – I **LINEAR FILTERS**

Introduction to Computer Vision, Linear Filters and Convolution, Shift In variant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates, Technique: Normalized Correlation and Finding Patterns, Technique: Scale and Image Pyramids.

UNIT – II **EDGE DETECTION**

Noise- Additive Stationary Gaussian Noise, Why Finite Differences Respond to Noise, Estimating Derivatives - Derivative of Gaussian Filters, Why Smoothing Helps, Choosing a Smoothing Filter, Why Smooth with a Gaussian? Detecting Edges-Using the Laplacianto Detect Edges.

UNIT – III **TEXTURE**

Representing Texture – Extracting Image Structure with Filter Banks, Representing Texture Using the Statistics of Filter Outputs, Analysis (and Synthesis) Using Oriented Pyramids -The Laplacian Pyramid, Filters in the Spatial Frequency Domain, Oriented Pyramids.,

UNIT – IV **SEGMENTATION BY CLUSTERING**

What is Segmentation, Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering
Pixels, Segmentation by Graph-Theoretic Clustering.

UNIT – V **RECOGNIZATION BY RELATIONS BETWEEN TEMPLATES**

Finding Objects by Voting on Relations between Templates, Relational Reasoning Using Probabilistic Models and Search, Using Classifiers to Prune Search, Hidden Markov Models, Application: HMM and Sign Language Understanding, Finding People with HMM.

4. Textbooks:

1. David A. Forsyth, Jean Ponce, Computer Vision- A Modern Approach, PHI, 2003.

Reference Books:

1. Geometric Computing with Clifford Algebras: Theoretical Foundations and Applications in Computer Vision and Robotics, Springer;1 edition,2001by Sommer.
2. Digital Image Processing and ComputerVision,1/e, by Sonka.
3. Computer Vision and Applications: Concise Edition (With CD) by Jack, Academy Press, 2000.

Online Learning Resources:

1. Introduction to Computer Vision and Image Processing | Coursera
2. Advanced Computer Vision with TensorFlow | Coursera

COURSE STRUCTURE
A30527- DevOps

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

This course enlightens the agile relationship between development and IT operations and provides the knowledge about various DevOps tools. It focuses on professional principles that help business units Collaborate inside the enterprise and break down traditional silos. The learner can lead his/her professional career in service and commercial enterprises.

2. Course Pre/co requisites

A1510 Software Engineering

3. Course Outcomes (COs)

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

A30527.1 Analyze DevOps methodologies in collaboration with the Development and Operation s team

A30527.2 Apply configuration management strategies for better integrations and deployment

A30527.3 Make use of various DevOps tools to ease of collaboration and development

A30527.4 Determine the speed of productivity for in time delivery

A30527. 5 Application deployment and configuration for uninterrupted usage

4. Course Syllabus

UNIT - I

SDLC: Introduction to SDLC, agile model.

Introduction to Devops: Introduction, Devops features, work management, source code management, build automation, delivery automation, understanding code quality, automation of CI/CD.

UNIT - II

Source Code Management: What is version control and GIT, standard branching workflows, Branching Workflow, GitHub flow.

UNIT - III

Build Automation , CI: Build(CI) Orchestration using Jenkins automation server, build tools , Apache Maven, Gradle, Ant, NPM/Node.js, pipeline Basics, Jenkins master, node, agent, and execu tor, freestyle projects & pipelines.

UNIT - IV

Artifact Management: Nexus, JFrogArtifactory, JFrogArtifactory as Kubernetis registry, Helm chart for Microsoft azure pipeline.

Continuous Delivery: Software components can be released in short cycles, every change is automatically deployed to the Dev environment.

UNIT - V

Continuous Deployment: Extends continuous delivery, every change is automatically deployed to Production, CD Flow, containerization with Docker, Introduction to Docker, images & containers, Docker File, working with

containers and publish to Docker Hub, Configuration management Ansible, Introduction to Ansible, Ansible tasks, Roles, Jinja templates, vaults, deployments using Ansible.

4. Books and Materials

TextBook(s)

1. Gene Kim, Jez Humble, Patrick Debois, John Willis, *The DevOps Handbook: How to Create World,Class Agility, Reliability,* 2016.

Reference Book(s)

1. Michael Huttermann, *DevOps for Developers*, 2012.
2. Joakim Verona**,** *Practical DevOps,* packet open source publications*,* 2016.

COURSE STRUCTURE
A33137 – RECOMMENDER 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 Overview

This specialisation on Recommender Systems covers the most important of recommendation algorithms, including content-based and collaborative filtering, dimensionality reduction, hybrid techniques, cross-domain and context-aware techniques.

2. Course Outcomes

A33137.1 To understand basic techniques and problems in the field of recommender systems

A33137.2 Evaluate Types of recommender systems: non-personalized, content based, collaborative filtering.

A33137.3 Apply algorithms and techniques to develop Recommender Systems that are widely used in the Internet industry.

A33137.4 To develop state-of-the-art recommender systems

3. Course Syllabus

UNIT - I

An Introduction to Recommender Systems, Neighbourhood -Based Collaborative Filtering, Goals of Recommender Systems, Basic Models of Recommender Systems, Domain-Specific Challenges in Recommender Systems. Advanced Topics and Applications. Introduction, Key Properties of Ratings Matrices, Predicting Ratings with Neighbourhood-Neighbourhood-Based Collaborative Filtering: Based Methods, Clustering and Neighbourhood-Based Methods, Dimensionality Reduction and Neighbourhood Methods, Graph Models for Neighbourhood-Based Methods, A Regression Modelling View of Neighbourhood Methods

UNIT - II

Model-Based Collaborative Filtering, Content-Based Recommender Systems, Decision and Regression Trees, Rule-Based Collaborative Filtering, Naive Bayes Collaborative Filtering, Using an Arbitrary Classification Model as a Black-Box, Latent Factor Models, Integrating Factorization and Neighbourhood Models.

Content-Based Recommender Systems:

Introduction, Basic Components of Content-Based Systems, reprocessing and Feature Extraction, Learning User Profiles and Filtering, Content-Based Versus Collaborative Recommendations, Using Content-Based Models for Collaborative Filtering, Summary.

UNIT – III

Knowledge-Based Recommender Systems, Ensemble-Based and Hybrid Recommender Systems, Constraint-Based Recommender Systems, Case-Based Recommenders, Persistent Personalization in Knowledge-Based Systems, Summary. Ensemble Methods from the Classification Perspective, Weighted Hybrids, Switching Hybrids, Cascade Hybrids, Feature Augmentation Hybrids, Meta-Level Hybrids, Feature Combination Hybrids, Summary.

UNIT - IV

Evaluating Recommender Systems, Context-Sensitive Recommender Systems, Evaluation Paradigms, General Goals of Evaluation Design, Design Issues in Offline Recommender Evaluation, Accuracy Metrics in Offline Evaluation, Limitations of Evaluation Measures, Limitations of Evaluation Measures. The Multidimensional Approach, Contextual Pre-filtering: A Reduction-Based Approach, Contextual Pre-filtering: A Reduction-Based Approach, Contextual Modelling.

UNIT – V

Time- and Location-Sensitive Recommender Systems, Temporal Collaborative Filtering, Discrete Temporal Models, Location-Aware Recommender Systems, Location-Aware Recommender Systems Location-Aware Recommender Systems, Summary.

4. Books and Materials

Textbooks:

1. Charu C. Aggarwal, “Recommender Systems”, Springer, 2016.

5. Reference Books:

1. Francesco Ricci, LiorRokach, “Recommender Systems Handbook”, 2nd ed., Springer, 2015 Edition

6. Online Learning Resources:

1. Recommendation System -Understanding the Basic Concepts (analyticsvidhya.com)
2. Recommender Systems | Coursera

COURSE STRUCTURE

A30558 - DESIGN PATTERNS

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 extends object-oriented programming by incorporating design patterns to create interactive applications. It includes patterns like creational, structural and behavioral. In addition it helps to recognize a design and enables to minimize the amount of refactoring by using primitive techniques such as objects, inheritance, and polymorphism. The learners will have a foundation to build more complex software applications.

Course Pre/co requisites

A1505- Object-oriented programming through JAVA

2. Course Outcomes (COs)

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

A30558.1 Apply the model-view-controller architecture for a given application

A30558.2 Propose the most suitable design pattern to solve a design problem

A30558.3 Inspect existing code to perform software refactoring

A30558.4 Apply the basic design principles for quality software

3. Course Syllabus

UNIT-I

Introduction to Design Patterns: Design pattern definition, design patterns in SmallTalk MVC, describing design patterns, catalog of design patterns, organizing the catalog, solving of design problems using design patterns, selection of a design pattern, use of design patterns.

UNIT-II

Creational Patterns: Abstract factory, builder, factory method, prototype, singleton, discussion of creational patterns.

UNIT-III

Structural Patterns: Adapter, bridge, composite**. Structural Patterns-2**: Decorator, façade, flyweight, proxy, discuss of structural patterns.

UNIT-IV

Behavioral Patterns Part-1: Chain of responsibility, command, interpreter, iterator, mediator, memento, observer.

UNIT-V

Behavioral Patterns Part -2: State, strategy, template method, visitor, and discussion of behavioral patterns. What to expect from design patterns, a brief history, the pattern community aninvitation, a parting thought.

4. Books and Materials

Text Book(s):

1. Erich Gamma, Rechard helm, Ralpjohnson, John vlissides, *Design PatternsElements of reusable object-oriented software*, Pearson Education, 2015.

Reference Book(s):

1. Mark Grand, *Patterns in JAVA* Vol-I, II & III, Wiley DreamTech, 2016.

2. Eric Freeman, Head *First Design Patterns*, second edition, O'reilly-spd 2014.

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COURSE STRUCTURE

A30529– CLOUD COMPUTING 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 aim of the laboratory is to provide insight of cloud computing architecture and its services. Students gain hands-on practice on various cloud service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) using Amazon Web Services (AWS), Microsoft azure and Google cloud platform. This course helps the learner to best utilize the cloud services in their domain and even helps in choosing cloud computing as their profession.

Course Pre/co requisites

A30014-Operating systems

A30015-Computer Networks

A35021-Cloud Computing

2. Course Outcomes (COs)

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

A30529.1 Develop and deploy applications for better cloud utility

A30529.2 Design web services for modern commercial applications

A30529.3 Analyze the performance, scalability, and availability of the underlying cloud technologies for business requirements

A30529.4 Implement software installation for utility of its applications

A30529.5 Compare various cloud computing platforms for better cloud services

3. Course Syllabus

List of cloud computing programs

1: Creating a Warehouse Application in SalesForce.com.

2: Creating an Application in SalesForce.com using Apex Programming Language.

3: Implementation of SOAP Web services in C#/JAVA Applications.

4: Para-Virtualization using VM Ware‘s Workstation/Oracle‘s Virtual Box and Guest O.S.

5: Installation and Configuration of Hadoop

6: Create an application (Ex: Word Count) using Hadoop Map/Reduce.

7: Case Study: PAAS (Facebook, Google App Engine).

8: Case Study: Amazon Web Services

4. Laboratory Equipment/Software/Tools Required

1. Amazon Web Services (AWS)
2. Microsoft Azure
3. Google Cloud Platform

5. Books and Materials

Text Book(s)

1. RajkumarBuyya, James Broberg, and Andrzej Goscinski, *Cloud Computing: Principles and Paradigms* by Wiley Press, New York, USA, 2017.

Reference Book(s)

1. Judith Hurwitz, Robin Bloor, Marcia Kaufman, Fern Halper, *Cloud computing for Dummies* (November

2016).

2. Michael J. Kavis, *Architecting the Cloud: Design Decisions for Cloud Computing Service Models* by, Wiley Press, 2016.

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COURSESTRUCTURE

A30532-BIG DATA ANALYTICS LABORATORY

HoursPerWeek			HoursPerSemester			Credits	AssessmentMarks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	40	60	100

Software Requirements:

1. **Hadoop :**https://hadoop.apache.org/release/2.7.6.html
2. **Java :**https://www.oracle.com/java/technologies/javase/javase8u211-later-archive-downloads.html
3. **Eclipse:** https://www.eclipse.org/downloads/

List of Experiments:

Experiment1:

Week1,2:

1. Implement the following Data structures in Java
   a)Linked Lists b)Stacks c) Queues d)Set e)Map

Experiment2:

Week3:

2. (i)Perform setting up and Installing Hadoop in its three operating modes:
   Standalone, Pseudo distributed, Fully distributed
   (ii)Use web based tools to monitor your Hadoop
   setup.

Experiment3:

Week4:

3. Implement the following file management tasks in Hadoop:
   - Adding files and directories
   - Retrieving files
   - Deleting files

   Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.

Experiment4:

Week5:

4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm**.**

Experiment5:

Week6:

5. Write a map reduce program that mines weather data.
   Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with Map Reduce, since it is semi structured and record-oriented.

Experiment6:

Week7:

6. Use Map Reduce to find the shortest path between two people in a social graph.
   Hint: Use an adjacency list to model a graph, and for each node store the distance from the original node, as well as a back pointer to the original node. Use the mappers to propagate the distance to the original node, and the reducer to restore the state of the graph. Iterate until the target node has been reached.

Experiment7:

Week8:

7. Implement Friends-of-friends algorithm in Map Reduce.

Hint: Two Map Reduce jobs are required to calculate the FoFs for each user in a social network .The first job calculates the common friends for each user, and the second job sorts the common friendsby the number of connections to your friends.

Experiment8:

Week9:

8. Implement an iterative Page Rank graph algorithm in Map Reduce.

Hint: Page Rank can be implemented by iterating a Map Reduce job until the graph has converged. The mappers are responsible for propagating node Page Rank values to their adjacent nodes, and the reducers are responsible for calculating new Page Rank values for each node, and for re-creating the original graph with the updated Page Rank values.

Experiment9:

Week10:

9. Perform an efficient semi-join in Map Reduce.

Hint: Perform a semi-join by having the mappers load a Bloom filter from the Distributed Cache, and then filter results from the actual Map Reduce data source by performing membership queries against the Bloom filter to determine which data source records should be emitted to the reducers.

Experiment10:

Week11:

10. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

Experiment11:

Week12:

11. Install and Run Hive then use Hive to create, alter, and drop data bases, tables , views, functions, and indexes

COURSESTRUCTURE

A30533-DATA VISUALISATION LABORATORY

HoursPerWeek			HoursPerSemester			Credits	AssessmentMarks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	40	60	100

COURSE OBJECTIVES:

Students will be able to

1. Understand the importance of data visualization for business intelligence and decision making.
2. Know approaches to understand visual perception
3. Learn about categories of visualization and application areas
4. Familiarize with the data visualization tools
5. Gain knowledge of effective data visuals to solve workplace problems

COURSE OUTCOMES:

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

1. Use Python, R and Tableau for data visualization
2. Apply data visuals to convey trends in data over time using tableau
3. Construct effective data visuals to solve workplace problems
4. Explore and work with different plotting libraries
5. Learn and create effective visualizations

LIST OF EXPERIMENTS

1. Introduction to various Data Visualization tools
2. Basic Visualization in Python
3. Basic Visualization in R
4. Introduction to Tableau and Installation
5. Connecting to Data and preparing data for visualization in Tableau
6. Data Aggregation and Statistical functions in Tableau
7. Data Visualizations in Tableau
8. Basic Dashboards in Tableau

Reference Books:

1. 1. Data visualization with python: create an impact with meaningful data insights using interactive and engaging visuals, Mario Dobler, Tim Grobmann, Packt Publications, 2019
2. Practical Tableau: 100 Tips, Tutorials, and Strategies from a Tableau Zen Master, Ryan Sleeper, Oreilly Publications, 2018
3. Data Visualization with R: 111 Examples by Thomas Rahlf, Springer, 2020

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COURSE STRUCTURE

A30036 INDIAN CONSTITUTION AND MULTICULTURALISM

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	0	100

1. Course Description

Course Overview

This course is designed in such a way that it gives an overview of Indian Constitution. This course provides the knowledge on importance of constitution, structure of executive, legislature and judiciary, central and state relation financial and administration.

Course Pre/co requisites

There are no prerequisites and co requisites for this course.

2. Course Outcomes (COs)

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

A30036.1 Understand historical background of the constitution making and its importance for building a democratic India.

A30036.2 Explain the role of President and Prime Minister.

A30036.3 Understand the functioning of three wings of the government ie., executive, legislative and judiciary.

A30036.4 Understand the value of the fundamental rights and duties for becoming good citizen of India

A30036.5 Analyze the decentralization of power between central, state and local self-government.

A30036.6 Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

3. Course Syllabus

UNIT - I

Introduction to Indian Constitution: Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT - II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, Prime Minister and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions.

UNIT - III

State Government and its Administration: Governor - Role and Position – Chief Minister and Council of ministers, State Secretariat: Organization, Structure and Functions.

UNIT - IV

Local Administration: District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: Zilla Panchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy.

UNIT - V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission: Functions of Commissions for the welfare of SC/ST/OBC and women.

4. Books and Materials

Text Book(s)

1. Durga Das Basu, *Introduction to the Constitution of India*, Prentice Hall of India Pvt. Ltd. New Delhi.
2. SubashKashyap, *Indian Constitution*, National Book Trust.

Reference Book(s)

1. A. Siwach, *Dynamics of Indian Government & Politics*.
2. D.C. Gupta, *Indian Government and Politics*.
3. H.M.Sreevai, *Constitutional Law of India*, 4th edition in 3 volumes (Universal Law Publication)