DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

ACADEMIC REGULATIONS (R21)

FOR

B. Tech Four Year Degree Programme

(Applicable for the batches admitted from the A.Y. 2021-22)

PACE INSTITUTE OF TECHNOLOGY AND SCIENCES
(Autonomous)
Approved by AICTE and Govt. of Andhra Pradesh, Accredited by NAAC(A Grade)
Recognized under 2(f) & 12(B) of UGC, Permanently Affiliated to JNTUK, Kakinada
NH-16, Near Valluramma Temple, Ongole-523272
Andhra Pradesh, India.

ACADEMIC REGULATIONS (R21) FOR B. TECH. (REGULAR)
Applicable for students of B. Tech. (Regular) from Academic Year 2021-22 onwards

Pace Institute of Technology and Sciences,Ongole, 2021 Regulations (R21 Regulations) applicable for all the students admitted into first year of all B.Tech programmes from the academic year 2021-22 & B.Tech Lateral Entry Scheme from the Academic Year 2022-23 onwards

1. **Courses of study:**
   The following courses of study are offered at Pace Institute of Technology and Sciences,Ongole

Sl No	Branch	Short name	Code
1	Civil Engineering	CE	01
2	Electrical and Electronics Engineering	EEE	02
3	Mechanical Engineering	ME	03
4	Electronics & Communication Engineering	ECE	04
5	Computer Science and Engineering	CSE	05
6	Computer Science and Information Technology	CSIT	07
7	Information Technology	IT	12
8	Computer Science and Engineering (Internet of Things and Cyber Security Including Block Chain Technology)	CSE(IoT&CSBT)	47
9	Artificial Intelligence and Data Science	AIDS	54
10	Artificial Intelligence and Machine Learning	AIML	61
11	*Computer Science and Engineering (Indian Language)	CSE-R	63

   * Notified in A.Y: 2022-2023

2. **Medium of Instruction:**
   The medium of instruction of the entire B. Tech undergraduate programme in Engineering & Technology (including examinations and project reports) will be in English only. Similarly, the medium of instruction and examinations in AICTE approved Indian language B.Tech programme are in Telugu and English.

3. **Admissions:**
   Admission to the B. Tech Programme shall be made subject to the eligibility, qualifications and specialization prescribed by the A.P. State Government/University from time to time. Admissions shall be made either on the basis of the merit rank obtained by the student in the common entrance examination conducted by the A.P. Government/University or on the basis of any other order of merit approved by the A.P. Government/University, subject to reservations as prescribed by the Government/University from time to time.

4. **Programme Pattern:**

   (i) Total duration of the B. Tech (Regular) Programme is four academic years.

(ii) Each Academic year of study is divided in to two semesters.

(iii) Minimum number of instruction days in each semester is 90.

(iv) Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).

(v) The total credits for the Programme are 160.

(vi) A three-week induction program is mandatory for all first year UG students and shall be conducted as per AICTE/UGC/APSCHE guidelines.

(vii) Student is introduced to "Choice Based Credit System (CBCS)".

(viii) A pool of interdisciplinary and job-oriented mandatory skill courses which are relevant to the industry are integrated into the curriculum of concerned branch of engineering (total five skill courses: two basic level skill courses, one on soft skills and other two on advanced level skill courses)

(ix) A student has to register for all courses in a semester.

(x) All the registered credits will be considered for the calculation of final CGPA.

(xi) Each semester has – "Continuous Internal Evaluation" (CIE) and "Semester End Examination" (SEE). Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and course structure as suggested by AICTE are followed.

(xii) A 10 months industry/field mandatory internship, both industry and social, during the summer vacation and also in the final semester to acquire the skills required for job and prepare engineering graduates to connect with the needs of the industry and society at large.

(xiii) The charactor of students and make them aware of social needs, the extracurricular/co-curricular activities are included, which do not carry any credits. These activities include National Service Scheme (NSS), National Cadet Corps (NCC), Yoga & Meditation, Sports & Games and Professional Club Activities.

(xiv) Each department shall assign a faculty advisor/mentor after admission to each student or group of students from same department to provide guidance in courses registration/career growth/ placements/opportunities for higher studies/GATE/other competitive exams etc.

5. **Subject/Course Classification:**

All subjects/courses offered for the undergraduate programme in E & T (B. Tech degree programmes) are broadly classified as follows.

6. **Registration for Courses:**

(i) The Department shall invite registration forms from the students at the beginning of the semester for the registration for courses each semester. The registration process shall be closed within one week. If any student

Sl No	Category	Code	APSCHE breakup of Credits	AICTE Credits of breakup
1	Humanities and social science including Management courses	HSMC	10.5	12
2	Basic Science courses	BSC	21	25
3	Engineering courses science	ESC	24	24
4	Professional core Courses	PCC	51	48
5	Open Elective Courses	OEC	12	18
6	Professional Courses Elective	PEC	15	18
7	Internship, seminar, project work	PROJ	16.5	15
8	Skill Oriented Courses	SC	10	-
9	Laboratory Courses	LC	-	-
10	Mandatory courses	MC	Non-credit	Non-credit
			160	160

wishes to withdraw the registration, he/she shall submit a letter to the principal through the class teacher/instructor and HOD. The principal shall communicate the registration and withdraw details courses of each student in a consolidated form to the college examination section.

(ii) There are four open electives in each branch. All Open Electives are offered to students of all branches in general. A student shall choose an open elective, by consulting the HOD/advisor, from the list in such a manner that he/she has not studied the same course in any form during the Programme.

(iii) A student shall be mandated to pursue two elective courses under MOOCs during the programme. Students are advised to register for only for minimum 12 weeks in duration MOOCs courses. Student has to pursue and acquire a certificate for a MOOC course only from the SWAYAM/NPTEL through online with the approval of Head of the Department in order to earn the 3 credits. The Head of the department shall notify the list of such courses at the beginning of the semester. The details of the MOOCs courses registered by the students shall be submitted to the college examination center. The Head of the Department shall appoint a mentor for each of the MOOC subjects registered by the students to monitor the student's assignment submissions given by SWAYAM/NPTEL. The student needs to submit all the assignments given and needs to take final exam at the proctor center. The student needs to earn a certificate by passing the exam. The student will be awarded the credits given in curriculum only by submission of the certificate. In case if student does not pass subjects registered through SWAYAM/NPTEL, the same or alternative equivalent subject may be registered again through SWAYAM/NPTEL in the next semester with the recommendation of HOD and shall be passed. Even, if any student not cleared the courses through MOOCs up to the 7^{th} semester, he/she has to register for external examination through offline

mode in last semester of the programme (i.e., 8^{th} Semester) at college level.

(iv) Two summer internships or one internship and one Community Service Project (CSP), each with a minimum of six weeks duration shall be mandatorily done/completed respectively at the end of second and third years (during summer vacations). The internship can be done by the students at local industries, Govt. Organizations, Construction agencies, Industries, Hydel and thermal power projects and also in software MNCs. After completing the summer internship, the students shall register in the immediate respective odd semester and it will be evaluated at the end of the semester as per norms of the college. The student has to produce the summer internship satisfactory report and certificate taken from the organization to be considered for evaluation. The Department shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship. The information pertaining to CSP is mentioned in Annexure-I.

(v) In the final semester, the student should mandatorily register and undergo internship and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. The project report shall be evaluated with an external examiner.

(vi) Curricular Framework for Skill oriented courses

(a) There are five (05) skill-oriented courses shall be offered during III to VII semesters and students must register and pass the courses successfully.

(b) For skill oriented/skill advanced course, one theory and two practical hours (1-0-2) or two theory hours (2-0-0) may be allotted as per the decision of concerned BOS.

(c) Out of the five skill courses; (i) two shall be skill-oriented courses from the same domain and shall be completed in second year (ii) Of the remaining three skill courses, one shall be 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.

(d) Students may register the interdisciplinary job-oriented skill courses based on the prerequisites and eligibility in consultation with HOD of the college.

(e) The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being

offered by Industries/Professional bodies/APSSDC or any other accredited bodies. However, the department has to assign mentors in the college to monitor the performance of the students.

(f) If a student chooses to take a Certificate Course offered by industries/Professional bodies/APSSDC or any other accredited bodies, in lieu of the skill advanced course offered by the Department, then the department shall mark overall attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate. However, the student is deemed to have fulfilled the attendance requirement of the course, if the external agency issues a certificate with satisfactory condition. If the certificate issued by external agency is marked with unsatisfactory condition, then the student shall repeat the course either in the college or at external agency. The credits will be awarded to the student upon producing the successful Course Completion Certificate from the agency/professional bodies and after passing in the viva-voce examination conducted at college as per college norms at the end of the semester.

7. **Award of B. Tech. Degree:**

(i) A student will be declared eligible for the award of B.Tech Degree if he fulfills the following academic regulations:

(a) A student shall be declared eligible for award of the B. Tech Degree, if he pursues a course of study in not less than four and not more than eight academic years.

(b) After eight academic years from the year of their admission, he/she shall forfeit their seat in B. Tech course and their admission stands cancelled.

(c) The student shall register for 160 credits and must secure all the 160 credits.

(d) All students shall register for NCC/NSS activities and will be required to participate in an activity specified by NSS officer during second and third semesters. Grade shall be awarded as Satisfactory or Unsatisfactory in the mark sheet on the basis of participation, attendance, performance and behavior. If a student gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.

(e) Courses like Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses. Environmental Sciences is to be offered compulsorily as mandatory course for all branches. A student has to secure 40% of the marks

allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

(f) Credit Definition:

1 Hour Lecture (L) per week	1 Credit
1 Hour Tutorial (T) per week	1 Credit
1 Hour Practical (P) per week	0.5 Credit
2 Hours Practical (Lab) per week	1 Credit

(ii) Award of B. Tech. (Honor)/B. Tech. (Minor):
B. Tech. with Honors or a B. Tech. with a Minor will be awarded if the student earns 20 additional credits are acquired as per the regulations/guidelines. The regulations/guidelines are separately provided. Registering for Honors/Minor is optional.

8. **Attendance Requirements:**

(i) A student is eligible to write the semester end examinations if he acquires a minimum of 40% in each course and 75% of attendance in aggregate of all the courses.

(ii) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) may be granted by the College Academic Committee. However, this condonation concession is applicable only to any two semesters during the entire programme.

(iii) Shortage of Attendance below 65% in aggregate shall not be condoned.

(iv) A student who is short of attendance in a semester may seek re-admission into that semester when offered within 4 weeks from the date of commencement of class work.

(v) Students whose shortage of attendance is not condoned in any semester are not eligible to write their semester end examination of that class.

(vi) A stipulated fee of Rs. 500/- in the concerned semester shall be payable towards condonation of shortage of attendance. Students availing condonation on medical ground shall produce a medical certificate issued by the competitive authority.

(vii) A student will be promoted to the next semester if he satisfies the (i) attendance requirement of the present semester and (ii) minimum required credits.

(viii) If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

(ix) For induction programme attendance shall be maintained as per AICTE norms.

(x) For non-credit mandatory courses the students shall maintain the attendance similar to credit courses.

9. **Evaluation-Distribution and Weightage of marks:**

(i) Paper setting and evaluation of the answer scripts shall be done as per the procedures laid down by the College Examination section from time to time.

(ii) For non-credit mandatory courses, like Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge, the student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

(iii) A student is deemed to have satisfied the minimum academic requirements if he has earned the credits allotted to each theory/practical design/drawing subject/ project etc by securing not less than 35% of marks in the semester end exam and minimum 40% of marks in the sum total of the internal marks and semester end examination marks together.

(iv) Distribution and Weightage of marks:

The assessment of the student's performance in each course will be based on Continuous Internal Evaluation (CIE) and Semester-End Examination (SEE). The performance of a student in each semester shall be evaluated course–wise with a maximum of 100 marks for theory course and 50 marks for practical course. For theory courses the distribution shall be 30 marks for Internal Evaluation and 70 marks for the Semester End Examinations.

Sl.No	Components	Internal	External	Total
1	Theory	30	70	100
2	Engineering Graphics/Design/Drawing	30	70	100
3	Practical	15	35	50
4	Internship/Industrial Training/ Skill Development programme/Research Project	-	50	50
5	Mini Project	50	-	50
6	Project Work	60	140	200

(v) Continuous Internal Theory Evaluation:

(a) For theory subjects, during a semester, there shall be two mid-term examinations. Each mid-term examination consists of (i) one online objective examination (ii) one descriptive examination and (iii) one assignment. The online examination (objective) shall be 10 marks and descriptive examination shall be for 15 marks with a total duration of 1 hour 50 minutes (20 minutes for objective and 90 minutes for descriptive paper).

(b) The first online examination (objective) is set with 20 multiple choice questions for 10 marks (20 questions x $\frac{1}{2}$ marks) from first two and half units (50% of the syllabus). The descriptive examination is set with 3 full questions for 5 marks each from first two and half units (50% of the syllabus), the student has to answer all questions. In the similar lines, the second online and descriptive examinations shall be conducted on the rest of the syllabus.

(c) The assignment is given by the concerned class teacher for five marks from first two and half units (50% of the syllabus). The second assignment shall be given from rest of the syllabus. The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination. However, There shall be no assignment with viva voce and class room tests for Applied/Engineering physics course. Finalized internal marks for Applied/Engineering physics course can be calculated with 80% weightage for the better of the two mid-term examinations and 20% for the other shall be considered for marks of 25 and is added to virtual lab - assignments 5 marks for awarding total 30 marks.

(d) The total marks secured by the student in each mid-term examination are evaluated for 30 marks. The first mid marks (Mid-1) consisting of marks of online objective examination, descriptive examination and assignment shall be submitted to the college examination section within one week after completion of first mid examination.

(e) The mid marks submitted to the college examination section shall be displayed in the concerned department notice boards for the benefit of the students.

(f) If any discrepancy found in the submitted Mid-1 marks, it shall be brought to the notice of college examination section within one week from the submission.

(g) Second mid marks (Mid-2) consisting of marks of online objective examination, descriptive examination and assignment shall also be submitted to College examination section within one week after completion of second mid examination and it shall be displayed in the notice boards. If any discrepancy found in the submitted mid-2 marks, it shall be brought to the notice of college examination section within one week from the submission.

(h) Internal marks can be calculated with 80% weightage for better of the two mids and 20% Weightage for another mid exam.

(i) Example:

Mid-1 marks =Marks secured in (online examination-1+descriptive examination-1 +one assignment-1)

Mid-2 marks=Marks secured in (online examination-2+ descriptive examination-2 +one assignment-2)

Final internal Marks = (Best of (Mid-1/Mid-2) marks x 0.8 + Least of (Mid-1/Mid-2) marks x 0.2)

(j) With the above criteria, college examination section will send mid marks of all courses in consolidated form to all the concerned departments and same shall be displayed in the concerned department notice boards. If any discrepancy found, it shall be brought to the notice of college examination section through proper channel within

one week with all proofs. Discrepancies brought after the given deadline will not be entertained under any circumstances.

(k) For practical subjects there shall be continuous evaluation during the semester for 15 internal marks .The internal 15 marks shall be awarded as follows: day to day work - 5 marks, Record-5 marks and the remaining 5 marks to be awarded by conducting an internal laboratory test.

(l) A student is required to undergo a mini project of his/her choice by applying theoretical concepts to develop a practical component /element/system that includes design/ testing/ analysis. The performance of a student in the mini project shall be internal evaluation by a three-member committee constituted by the HoD as per the following parameters: Innovation-10 Marks, Mini project report-15 Marks, Presentation-15 Marks and remaining 10 Marks to be awarded by conducting an internal Viva voce.

(vi) Semester End Theory Examinations Evaluation:

(a) The semester end examinations will be conducted college examination section for 70 marks consists of five questions carrying 14 marks each. Each of these questions is from one unit and may contain subquestions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

(b) For practical subjects the end examination shall be conducted by the teacher concerned and external examiner appointed by Chief Controller of Examinations for 35 marks.

Note: Laboratory marks and the internal marks awarded by the department are not final. The marks are subject to scrutiny and scaling by the Chief Controller of Examinations wherever felt desirable. The internal and laboratory marks awarded by the department will be referred to a Committee. The Committee shall arrive at a scaling factor and the marks will be scaled as per the scaling factor. The recommendations of the Committee are final and binding. All the laboratory records and internal test papers shall be preserved in respective departments as per college norms and shall be produced to the Committees of University as and when they ask for.

(c) For the course having design and / or drawing (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 30 marks for internal evaluation (15 marks for continuous Assessment (day–to–day work) and 15 marks for internal tests) and 70 marks for end examination. There shall be two internal tests in a Semester for 15 marks each and final marks can be calculated with 80% weightage for better of the two tests and 20% weightage for other test and these are to be added to the marks obtained in day-to-day work.

(d) Evaluation of the summer internships: It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs in the area of concerned specialization of the UG programme. Students shall pursue this internship during summer vacation just before its offering as per course structure. The minimum duration of this course shall be at least 6 weeks. The student shall register for the internship as per course structure after commencement of academic year. A supervisor/mentor/advisor has to be allotted to guide the students for taking up the summer internship. The supervisor shall monitor the attendance of the students while taking up the internship. Attendance requirements are as per the norms of the College. After successful completion, students shall submit a summer internship technical report to the concerned department and appear for an oral presentation before the departmental committee consists of an external examiner appointed by the Chief Controller of Examinations; Head of the Department, supervisor of the internship and a senior faculty member of the department. A certificate from industry/skill development center shall be included in the report. The report and the oral presentation shall carry 40% and 60% weightages respectively. It shall be evaluated for 50 external marks at the end of the semester. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the College.

(e) The job-oriented skill courses may be registered at the department or at any accredited external agency. A student shall submit a record/ report on the on the list skills learned. If the student completes job-oriented skill course at external agency, a certificate from the agency shall be included in the report. The course will be evaluated at the end of the semester for 50 marks (record: 15 marks and viva-voce: 35 marks) along with laboratory end examinations in the presence of external (appointed by the Chief Controller of Examinations) and internal examiner (course instructor or mentor). There are no internal marks for the job-oriented skill courses.

(f) Mandatory Course (M.C): Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc non-credit (zero credits) mandatory courses. Environmental Sciences shall be offered compulsorily as mandatory course for all branches. A minimum of 75% attendance is mandatory in these subjects. There shall be an external examination for 70 marks and it shall be conducted by the department internally. Two internal examinations shall be conducted for 30 marks and a student has to

secure at least 40% of the marks for passing the course. There is no online internal exam for mandatory courses. No marks or letter grade shall be printed in the transcripts for all mandatory non-credit courses, but only Completed (SA)/Not-completed (US) will be specified.

(g) Elective Course through Massive Open Online Course (MOOC) as Program Elective course. The student shall register for the course (Minimum of 12 weeks) offered by SWAYAM/NPTEL through online with the approval of Head of the Department. The Head of the Department shall appoint one mentor for each of the MOOC subjects offered. The student needs to register the course in the SWAYAM/NPTEL portal. During the course, the mentor monitors the student's assignment submissions given by SWAYAM/NPTEL. The student needs to submit all the assignments given and needs to take final exam at the proctor center. The student needs to earn a certificate by passing the exam. The student will be awarded the credits given in curriculum only by submission of the certificate. In case if student does not pass subjects registered through SWAYAM/NPTEL, the same or alternative equivalent subject may be registered again through SWAYAM/NPTEL in the next semester with the recommendation of HOD and shall be passed.

(h) Major Project (Project - Project work, seminar and internship in industry): In the final semester, the student should mandatorily register and undergo internship and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. The project report shall be evaluated with an external examiner. Evaluation: The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner appointed by the Chief Controller of Examinations and is evaluated for 140 marks.

10. **Recounting of Marks in the Semester End Examination:**
A student can request for recounting of his/her answer book on payment of a prescribed fee as per college norms.

11. **Re-evaluation of the End Semester Examination:**
A student can request for Revaluation of his/her answer book on payment of a prescribed fee as per college norms.

12. **Supplementary Examinations:**
A student who has failed to secure the required credits can appear for a supplementary examination, as per the schedule announced by the college.

13. **Malpractices in Examinations:**
Disciplinary action shall be taken in case of malpractices during Mid/End examinations as per the rules framed by the college.

14. **Promotion Rules:**
The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.8 for promotion to higher classes

    (a) A student shall be promoted from first year to second year if he fulfills the minimum attendance requirement as per College norms.
    (b) A student will be promoted from II to III year if he fulfills the academic requirement of 40% of credits up to either II year I-Semester or II year II-Semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II year II semester.
    (c) A student shall be promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits up to either III year I semester or III year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.

15. **Course Pattern:**
The entire course of study is for four academic years; all years are on semester pattern

    (a) A student eligible to appear for the semester end examination in a course, but absent from it or has failed in the semester end examination, may write the exam in that course when conducted next.
    (b) When a student is detained for lack of credits/shortage of attendance, he may be re-admitted into the same semester/year in which he has been detained. However, the academic regulations under which he was first admitted shall continue to be applicable to him.

16. **Earning of Credit:**
A student shall be considered to have completed a course successfully and earned the credits if he/she secures an acceptable letter grade in the range A+ to E as given below. Letter grade 'F' in any course implies failure of the student in that course and no credits earned. Absent is also treated as no credits earned. For project same % percentages will be followed for grading.

Marks Range Theory (Max – 100)	Marks Range Lab (Max – 50)	Level	Letter Grade	Grade Point
≥ 90	≥ 45	Outstanding	O	10
$\geq 80 \leq 89$	$\geq 40 \leq 44$	Excellent	S	9
$\geq 70 \leq 79$	$\geq 35 \leq 39$	Very Good	A	8
$\geq 60 \leq 69$	$\geq 30 \leq 34$	Good	B	7
$\geq 50 \leq 59$	$\geq 25 \leq 29$	Fair	C	6
$\geq 40 \leq 49$	$\geq 20 \leq 24$	Pass	P	5
<40	<20	Fail	F	0
-	-	Absent	AB	0

17. **Computation of SGPA and CGPA**

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

(a) SGPA(S_k) of k^{th} semester (1 to 8) is 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 total number of credits of all the courses undergone/registered by a student, i.e.,

$$SGPA(S_k) = \frac{\sum_{i=1}^{n}(C_i \times G_i)}{\sum_{i-1}^{n} C_i}$$

(b) CGPA: The CGPA is calculated in the same manner taking into account all the 'm' courses/subjects registered by student over all the semesters of a Programme i.e., in all eight semesters

$$CGPA = \frac{\sum_{i=1}^{n}(C_i \times S_i)}{\sum_{i-1}^{n} C_i}$$

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

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

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

(f) Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters O, S, A, B, C, P, F and AB.

(g) As per AICTE regulations, conversion of CGPA into equivalent percentage as follows:

$$EquivalentPercentage = (CGPA – 0.75) \times 10$$

(h) Illustration of Computation of SGPA and CGPA

(i) **Illustration for SGPA:**

Let us assume there are 6 subjects in a semester. The grades obtained as follows:

Course	Credit	Grade Obtained	Grade point	Si= Credit Point (Credit x Grade)
Subject 1	3	A	8	3 X 8 = 24
Subject 2	4	B	7	4 X 7 = 28
Subject 3	3	C	6	3 X 6 = 18
Subject 4	3	O	10	3 X 10 = 30
Subject 5	3	P	5	3 X 5 = 15
Subject 6	4	C	6	4 X 6 = 24
	20			139

Thus, SGPA =139/20 =6.95=6.9 (approx.)

Semester 1	Semester 2	Semester 3	Semester 4
Credits: 19.5 SGPA: 6.9	Credits: 19.5 SGPA: 7.8	Credits: 21.5 SGPA: 5.6	Credits: 21.5 SGPA: 6.0
Semester 5	Semester 6	Semester 7	Semester 8
Credits: 21.5 SGPA: 6.3	Credits: 21.5 SGPA: 8.0	Credits: 23 SGPA: 6.4	Credits: 12 SGPA: 7.5

(ii) **Illustration for CGPA:**

Thus,

$CGPA = \frac{19.5\times6.9+19.5\times7.8+21.5\times5.6+21.5\times6.0+21.5\times6.3+21.5\times8.0+23\times6.4+12\times7.5}{160} = 6.75$

18. **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 to be secured	Remarks
First Class with Distinction	$\geq$ 7.75 (without any supplementary appearance)	From the CGPA secured from 160 credits
First Class	$\geq$ 6.75	
Second Class	$\geq$ 5.75 <6.75	
Pass Class	$\geq$ 5.00 <5.75	

19. **Minimum Instruction Days**

The minimum instruction days for each semester shall be 90 working days. There shall be no branch transfers after the completion of the admission process. There shall be no transfer from one college/stream to another within the Constituent Colleges and Units of Jawaharlal Nehru Technological University Kakinada.

20. **Withholding of Results**

If the student is involved in indiscipline/malpractices/court cases, the result of the student will be withheld.

21. **Transitory Regulations**

(i) Discontinued or detained candidates are eligible for re-admission as and when next offered.

(ii) The re-admitted candidate will be governed by the rules & regulations under which the candidate has been admitted.

(a) In case of transferred students from other Universities, credits shall be transferred to PACE as per the academic regulations and course structure of College.

(b) The students seeking transfer to PACE from various other Universities / Institutions have to obtain the credits of any equivalent subjects as prescribed by PACE. In addition, the transferred candidates have to pass the failed subjects at the earlier Institute with already obtained internal/sessional marks to be conducted by PACE.

22. **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 I/II/III year to pursue entrepreneurship full time. This period shall be counted for the maximum time for graduation. An evaluation committee at college level shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for availing the Gap Year.

23. **General**

(i) Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

(ii) The academic regulation should be read as a whole for the purpose of any interpretation.

(iii) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the competent authority of the college is final.

(iv) The College may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the College.

ACADEMIC REGULATIONS (R21) FOR B. TECH. (LATERAL ENTRY SCHEME)
Applicable for students admitted into II B. Tech. from the Academic Year 2022-23 onwards

1. **Award of B. Tech. Degree**
   A student will be declared eligible for the award of B. Tech. Degree if he fulfills the following academic regulations:

   (a) A student shall be declared eligible for the award of the B. Tech Degree, if he pursues a course of study in not less than three academic years and not more than six academic years. After six academic years from the year of their admission, he/she shall forfeit their seat in B. Tech course and their admission stands cancelled.

   (b) The candidate shall register for 121 credits and secure all the 121 credits.

2. **The attendance regulations of B. Tech. (Regular) shall be applicable to B.Tech (lateral entry).**

3. **Promotion Rule**
   A student shall be promoted from second year to third year if he fulfills the minimum attendance requirement.
   A student shall be promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits up to either III year I semester or III year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.

4. **Award of Class**
   After a student has satisfied the requirement 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 to be secured	Remarks
First Class with Distinction	$\geq$ 7.75 (without any supplementary appearance)	From the CGPA secured from 121 credits
First Class	$\geq$ 6.75	
Second Class	$\geq$ 5.75 <6.75	
Pass Class	$\geq$ 5.00 <5.75	

   The Grades secured, Grade points and Credits obtained will be shown separately in the memorandum of marks.

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

Annexure-I

COMMUNITY SERVICE PROJECT

I. Introduction

(1) Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development

(2) Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.

(3) Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution.

II. Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

(i) To sensitize the students to the living conditions of the people who are around them

(ii) To help students to realize the stark realities of the society.

(iii) To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability

(iv) To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.

(v) To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.

(vi) To help students to initiate developmental activities in the community in coordination with public and government authorities.

(vii) To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

III. Implementation of Community Service Project

(i) Every student should put in a minimum of 180 hours for the Community Service Project during the summer vacation.

(ii) Each class/section should be assigned with a mentor.

(iii) Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc

(iv) A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.

(v) The log book has to be countersigned by the concerned mentor/faculty in charge.

(vi) Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.

(vii) The final evaluation to be reflected in the grade memo of the student.

(viii) The Community Service Project should be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.

(ix) Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.

(x) Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training

IV. **Procedure**

(1) A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.

(2) The Community Service Project is a twofold one –

(a) First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.

(b) Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –

- Agriculture
- Health
- Marketing and Cooperation
- Animal Husbandry

- Horticulture
- Fisheries
- Sericulture
- Revenue and Survey
- Natural Disaster Management
- Irrigation
- Law & Order
- Excise and Prohibition
- Mines and Geology
- Energy
- Internet
- Free Electricity
- Drinking Water

(V) **Expected Outcomes**

(1) Benefits of Community Service Project to Students

Learning Outcomes

(a) Positive impact on students' academic learning

(b) Improves students' ability to apply what they have learned in "the real world"

(c) Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development

(d) Improved ability to understand complexity and ambiguity

Personal Outcomes

(a) Greater sense of personal efficacy, personal identity, spiritual growth, and moral development

(b) Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills

Social Outcomes

(a) Reduced stereotypes and greater inter-cultural understanding

(b) Improved social responsibility and citizenship skills

(c) Greater involvement in community service after graduation

Career Development

(a) Connections with professionals and community members for learning and career opportunities

(b) Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity

Relationship with the Institution

(a) Stronger relationships with faculty

(b) Greater satisfaction with college

(c) Improved graduation rates

(2) Benefits of Community Service Project to Faculty Members

(a) Satisfaction with the quality of student learning

(b) New avenues for research and publication via new relationships between faculty and community

(c) Providing networking opportunities with engaged faculty in other disciplines or institutions

(d) A stronger commitment to one's research

(3) Benefits of Community Service Project to Colleges and Universities

(a) Improved institutional commitment

(b) Improved student retention

(c) Enhanced community relations

(4) Benefits of Community Service Project to Community

(a) Satisfaction with student participation

(b) Valuable human resources needed to achieve community goals

(c) New energy, enthusiasm and perspectives applied to community work

(d) Enhanced community-university relations.

VI. **Suggestive List of Programmes Under Community Service Project**

(a) The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions and modifications. Colleges are expected to focus on specific local issues for this kind of projects. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of projects. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting shall be ensured.

(b) For Engineering Students

- Water facilities and drinking water availability
- Health and hygiene
- Stress levels and coping mechanisms
- Health intervention programmes
- Horticulture
- Herbal plants
- Botanical survey
- Zoological survey
- Marine products

- Aqua culture
- Inland fisheries
- Animals and species
- Nutrition
- Traditional health care methods
- Food habits
- Air pollution
- Water pollution
- Plantation
- Soil protection
- Renewable energy
- Plant diseases
- Yoga awareness and practice
- Health care awareness programmes and their impact
- Use of chemicals on fruits and vegetables
- Organic farming
- Crop rotation
- Floury culture
- Access to safe drinking water
- Geographical survey
- Geological survey
- Sericulture
- Study of species
- Food adulteration
- Incidence of Diabetes and other chronic diseases
- Human genetics
- Blood groups and blood levels
- Internet Usage in Villages
- Android Phone usage by different people
- Utilization of free electricity to farmers and related issues
- Gender ration in schooling level- observation.

Complimenting the community service project, the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programmes are;

(c) Programmes for School Children

- Reading Skill Programme (Reading Competition)
- Preparation of Study Materials for the next class.
- Personality / Leadership Development
- Career Guidance for X class students
- Screening Documentary and other educational films

- Awareness Programme on Good Touch and Bad Touch (Sexual abuse)
- Awareness Programme on Socially relevant themes.

(d) Programmes for Women Empowerment

- Government Guidelines and Policy Guidelines
- Womens' Rights
- Domestic Violence
- Prevention and Control of Cancer
- Promotion of Social Entrepreneurship

(e) General Camps

- General Medical camps
- Eye Camps
- Dental Camps
- Importance of protected drinking water
- ODF awareness camp
- Swatch Bharat
- AIDS awareness camp
- Anti Plastic Awareness
- Programmes on Environment
- Health and Hygiene
- Hand wash programmes
- Commemoration and Celebration of important days

(f) Programmes for Youth Empowerment

- Leadership
- Anti-alcoholism and Drug addiction
- Anti-tobacco
- Awareness on Competitive Examinations
- Personality Development

(g) Common Programmes

- Awareness on RTI
- Health intervention programmes
- Yoga
- Tree plantation
- Programmes in consonance with the Govt. Departments like –
  - Agriculture
  - Health
  - Marketing and Cooperation
  - Animal Husbandry
  - Horticulture
  - Fisheries

- Sericulture
- Revenue and Survey
- Natural Disaster Management
- Irrigation
- Law & Order
- Excise and Prohibition
- Mines and Geology
- Energy

VII. **Role of Students:**

(a) Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.

(b) For conducting special camps like Health related, they will be coordinating with the Governmental agencies.

(c) As and when required the College faculty themselves act as Resource Persons.

(d) Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.

(e) And also, with the Governmental Departments. If the programme is rolled out, the District Administration could be roped in for the successful deployment of the programme.

(f) An in-house training and induction programme could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

Timeline for the Community Service Project Activity

1. **Duration: 8 weeks**

(a) Preliminary Survey (One Week)

(i) A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.

(ii) A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.

(iii) The Governmental agencies, like revenue administration, corporation and municipal authorities and village secretariats could be aligned for the survey.

(b) Community Awareness Campaigns (Two Weeks)
Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread

over two weeks of time. The list of activities suggested could be taken into consideration.

(c) Community Immersion Programme (Four Weeks)

Along with the Community Awareness Programmes, the student batch can also work with any one of the below listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to the experiential learning about the community and its dynamics. Programmes could be in consonance with the Govt. Departments.

(d) Community Exit Report (One Week)

During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks works to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that particular habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the College Examination section.

Throughout the Community Service Project, a daily log-book need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.

Annexure-II

MALPRACTICES RULES
DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

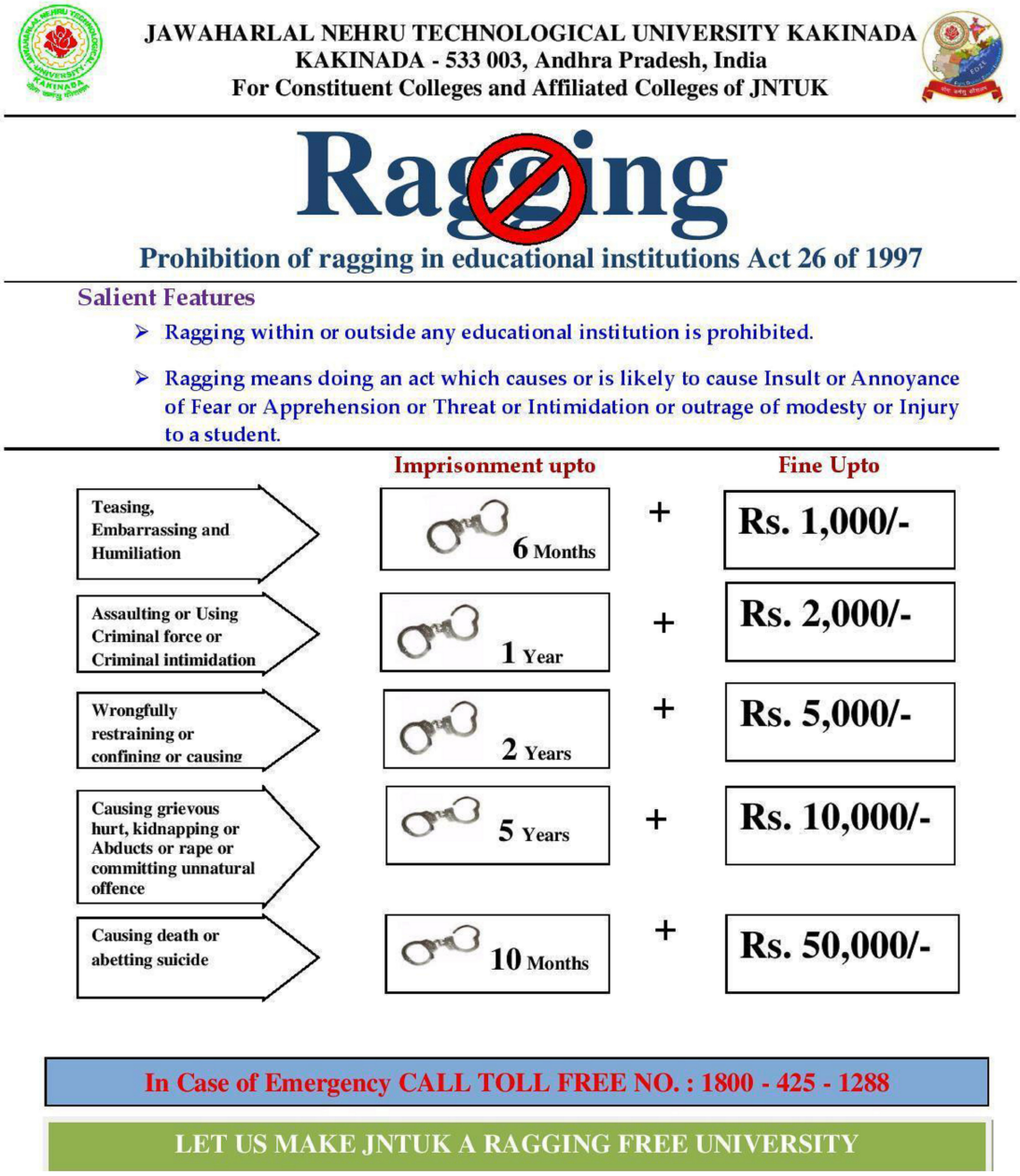
Sl. No.	Nature of Malpractices/Improper conduct If the candidate:	Punishment
1. a.	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
1. b.	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
3	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

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

7	Leaves the exam hall taking away answer script or intentionally tears the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all Semester End Examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9	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 clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The 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 will be registered against them.
10	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.

12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Chief Controller of Examinations for further action and impose suitable punishment.	

Annexure-III



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India
For Constituent Colleges and Affiliated Colleges of JNTUK

Ragging

ABSOLUTELY NO TO RAGGING

1. **Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.**
2. **Ragging entails heavy fines and/or imprisonment.**
3. **Ragging invokes suspension and dismissal from the College.**
4. **Outsiders are prohibited from entering the College and Hostel without permission.**
5. **Girl students must be in their hostel rooms by 7.00 p.m.**
6. **All the students must carry their Identity Cards and show them when demanded**
7. **The Principal and the Wardens may visit the Hostels and inspect the rooms any time.**

Jawaharlal Nehru Technological University Kakinada
For Constituent Colleges and Affiliated Colleges of JNTUK

In Case of Emergency CALL TOLL FREE NO. : 1800 - 425 - 1288

LET US MAKE JNTUK A RAGGING FREE UNIVERSITY

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

PACE R-21 UNDER GRADUATE (B.Tech) COURSE STRUCTURE

I Year - I Semester						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	P21HST01	Communicative English	3	0	0	3
2	P21BST01	Linear Algebra & Differential Equations	3	0	0	3
3	P21BST04	Applied Chemistry	3	0	0	3
4	P21EST03	C-Programming for Problem Solving	3	0	0	3
5	P21EST04	Computer Engineering Workshop	3	0	0	3
6	P21HSL01	English Language Communication Skills Lab	0	0	3	1.5
7	P21BSL03	Applied Chemistry Lab	0	0	3	1.5
8	P21ESL02	C-Programming for Problem Solving Lab	0	0	3	1.5
9	P21MCT01	Induction program	2	0	0	0
Total Credits						19.5

I Year - II Semester						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	P21BST06	Numerical Methods & Vector calculus	3	0	0	3
2	P21BST02	Applied Physics	3	0	0	3
3	P21EST12	Digital Electronics	3	0	0	3
4	P21EST13	Data Structures	3	0	0	3
5	P21EST14	Python Programming	3	0	0	3
6	P21BSL01	Applied Physics Lab	0	0	3	1.5
7	P21ESL06	Data Structures Lab	0	0	3	1.5
8	P21ESL07	Python Programming Lab	0	0	3	1.5
Total Credits						19.5

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
PACE R-21 UNDER GRADUATE (B.Tech) COURSE STRUCTURE

II Year - I Semester						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	P21BST07	Probability & Statistics	3	0	0	3
2	P21CST01	Java Programming	3	0	0	3
3	P21CSL02	Front end Web Technologies	3	0	0	3
4	P21CST03	Computer Organization	3	0	0	3
5	P21CST04	Software Engineering	3	0	0	3
6	P21CSL01	Java Programming Lab	0	0	3	1.5
7	P21CSL02	Front end Web Technologies Lab	0	0	3	1.5
8	P21CSL03	Free Open Source Software Lab	0	0	3	1.5
9	P21CSS01	Source code Management using Git & Github	1	0	2	2
10	P21MCT03	Environmental Science	2	0	0	0
Total Credits						21.5

II Year - II Semester						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	P21CST05	Mathematical Foundations of Computer Science	3	0	0	3
2	P21CST08	Design and Analysis of Algorithms	3	0	0	3
3	P21CST06	Advanced Python Programming	3	0	0	3
4	P21CST07	Database Management Systems	3	0	0	3
5	P21SST01	Developing Soft Skills and Personality	3	0	0	3
6	P21CSL06	R Programming Lab	0	0	3	1.5
7	P21CSL04	Advanced Python Programming Lab	0	0	3	1.5
8	P21CSL05	Database Management Systems Lab	0	0	3	1.5
9	P21CSS02	Data Science using Python	1	0	2	2
Total Credits						21.5
Internship 2 Months (Mandatory) during summer vacation						

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R-21 UNDER GRADUATE (B.Tech) COURSE STRUCTURE

III Year - I Semester						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	P21CST09	Computer Networks	3	0	0	3
2	P21CST10	Operating Systems	3	0	0	3
3	P21AMT01	Machine Learning	3	0	0	3
4	P21XXXXX	Professional Elective-I	3	0	0	3
5	P21XXXXX	Open Elective-I	3	0	0	3
6	P21CSL07	Computer Networks & Operating systems Lab	0	0	3	1.5
7	P21AML01	Machine Learning Lab	0	0	3	1.5
8	P21CSS03	Android application development	1	0	2	2
9	P21XXXXX	Design Thinking for Innovation	2	0	0	0
10	P21XXXXX	Summer Internship 2 Months (Mandatory) after II Year (to be evaluated during III Year I Semester)	0	0	0	1.5
Total Credits						21.5

Professional Elective - I		
S.No	**Course Code**	**Course Title**
1	MOOC- I	NPTEL

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R-21 UNDER GRADUATE (B.Tech) COURSE STRUCTURE

III Year - II Semester						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	P21CST11	Cryptography & Network Security	3	0	0	3
2	P21CST12	Advanced Java & Web Technologies	3	0	0	3
3	P21CST13	Automata Theory & Compiler Design	3	0	0	3
4	P21XXXX	Professional Elective-II	3	0	0	3
5	P21XXXX	Open Elective-II	3	0	0	3
6	P21CSL08	Software Lab	0	0	3	1.5
7	P21CSL09	Advanced Java & Web Technologies Lab	0	0	3	1.5
8	P21CSL10	UML Lab	0	0	3	1.5
9	P21CSS04	Employability Skills	1	0	2	2
10	P21XXXXX	Entrepreneurship and Innovation	2	0	0	0
Total Credits						21.5
Industrial/Research Internship (Mandatory) 2 Months during summer vacation						

Professional Elective - II		
S.No	**Course Code**	**Course Title**
1	MOOC- II	NPTEL

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R-21 UNDER GRADUATE (B.Tech) COURSE STRUCTURE

IV Year - I Semester						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	P21CSXXX	Professional Elective-III	3	0	0	3
2	P21CSXXX	Professional Elective-IV	3	0	0	3
3	P21CSXXX	Professional Elective-V	3	0	0	3
4	P21XXXXX	Open Elective-III	3	0	0	3
5	P21XXXXX	Open Elective-IV	3	0	0	3
6	P21XXXXX	Universal Human Values-II	3	0	0	3
7	P21CSXXX	Skill Advanced Oriented /Soft Skill Course	1	0	2	2
8	P21CSXXX	Industrial/Research Internship 2 Months (Mandatory) after III Year (to be evaluated during IV Year I Semester)	0	0	0	3
Total Credits						23

Professional Elective - III		
S.No	**Course Code**	**Course Title**
1	P21CSE01	Cloud Computing
2	P21CSE02	Computer Vision
3	P21CSE03	Social Media Analytics
3	P21CSE04	Agile Methodologies

Professional Elective - IV		
S.No	**Course Code**	**Course Title**
1	P21CSE05	Fundamentals of AR/VR
2	P21CSE06	Natural Language Processing
3	P21CSE07	Internet of Things
3	P21CSE08	Cyber Security

Professional Elective - V		
S.No	**Course Code**	**Course Title**
1	P21CSE09	Block chain Technology
2	P21CSE10	Reinforcement Learning
3	P21CSE11	Full stack Development
3	P21CSE12	Human Computer Interaction

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R-21 UNDER GRADUATE (B.Tech) COURSE STRUCTURE

IV Year - II Semester						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	P21XXXX	Project Work, Seminar and Internship in Industry	0	0	0	12
Internship (6 Months)						
Total Credits						12

Course Code	Course Name	Course Structure			
		L	T	P	C
P21HST01	Communicative English	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: The students should have basic knowledge of English grammar and LSRW skills.

Course Objectives: The student will be able

1. To enable the engineering students to develop their basic communication skills in English for academic and social purposes.
2. To equip the students with appropriate oral and written communication skills.
3. To inculcate the skills of listening, reading and critical thinking.
4. To integrate English Language learning with employability skills and training.
5. To enhance the students' proficiency in reading skills enabling them to meet the academic demands of their course.

Course Outcomes: After going through this course the student will be able to

1. Use English Language effectively in spoken and written forms
2. Interpret the contextual meaning of words
3. Comprehend the given texts and respond appropriately
4. Recall and reproduce the theme in a given context
5. Communicate confidently in formal and informal contexts

UNIT–I **(9 Lectures)**

a. Reading Skills: Leela's Friend – R.K. Narayan
b. Vocabulary: Synonyms, Antonyms and Word formation, Root Words
c. Grammar: Parts of Speech, Sentence structure and Types of sentences
d. Writing: Letter Writing, Note Making and Note Taking

UNIT–II **(10 Lectures)**

a. Reading Skills: Dr. A.P.J. Abdul Kalam's Biography
b. Vocabulary: Prefixes, Suffixes and Affixes
c. Grammar: Prepositions and Articles
d. Writing: Paragraph Writing and Precis Writing

UNIT–III **(9 Lectures)**

a. Reading Skills: Three Days to See – Helen Keller
b. Vocabulary: Collocations, One word substitutes & Idioms
c. Grammar: Tenses, Active voice & Passive voice
d. Writing: Technical Report Writing

UNIT–IV **(9 Lectures)**

a. Reading Skills: Satya Nadella's Email to His Employees on His First Day as CEO of Microsoft
b. Vocabulary: Phrasal verbs and Commonly confused words
c. Grammar: Subject–Verb Agreement (Concord) and Question tags
d. Writing: Curriculum vitae, Cover Letter and Resume Writing. (Functional, Chronological and standard Resumes)

UNIT–V **(9 Lectures)**

a. Reading Skills: Mokshagundam Visveswaraya
b. Vocabulary: Homonyms, Homophones and Homographs
c. Grammar: Modal Auxiliaries, Degrees of Comparison and Direct speech & Indirect Speech
d. Writing: E- mail Writing and Essay Writing

Text Books:

1. New Horizons – Pearson Publishers
2. Fluency in English", A Course Book for Engg. Students, Published by Orient Black Swan, Hyderabad, 2016 print.
3. "Technical Communication- Principles and Practice", Third Edition. New Delhi: Oxford University press.
4. Epitome of Wisdom – Maruthi Publications

Reference Books:

1. Meenakshi raman, Sangeetha, Sharma Fundamentals of technical communication, Pg: 119-153 Oxford University press, 2015
2. Rutherford, Andhrea. J, Communication skills for technology. Pearson, New Delhi.2001
3. Raymond Murphy, Murphy's English Grammar, Cambridge University Press 2004
4. Meenakshi raman, Sangeetha, Sharma,Technical communication: English Skills for Engineers, Oxford University press, 2009
5. Michael Swan, Practical English Usage, Oxford University press, 1996

Web Resources:

1. `www.englishhints.com`
2. `www.enchantedlearning.com`
3. `www.learnenglish.de/grammar/prefixtext.html`

4. http://www.magickeys.com/books/riddles/words.html
5. http://www.pinnacle.edu.in/campusfiles/1826_campusFile_1.pdf
6. http://www.yourdictionary.com
7. http://www.learnenglish.com
8. http://www.cambridge.org
9. http://www.eslcafe.com
10. http://www.eslgames.com
11. http://www.penguin.co.uk
12. http://www.edufind.com/english/practice
13. www.englishhints.com,www.enchantedlearning.com,
14. www.learnenglish.de/grammar/prefixtext.html
15. http://www.magickeys.com/books/riddles/words.html

Course Code	Course Name	Course Structure			
		L	T	P	C
P21BST01	Linear Algebra & Differential Equations	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Basics of Matrix Algebra, Differentiation, Integration

Course Objectives: The student will be able to

1. The concept of rank of a matrix which is used to know the consistency of system of linear equations and find the solution by using various analytical and numerical methods.
2. Eigen values and eigenvectors of a given matrix. Cayley-Hamilton theorem to find the inverse and power of a matrix and determine the nature of the quadratic form,
3. Recognize and model differential equations, apply analytical techniques to compute solutions for engineering problems.
4. The general solution to the higher order linear differential equations and applies to calculate the current in electrical circuits.
5. Explore the use of Laplace transform method to solve with initial value problems of ordinary differential equations.

Course Outcomes: After going through this course the student will be able to

1. Demonstrate the understanding of rank of a matrix. Analyze the solution of the system of linear equations.
2. Find the Eigen values and Eigenvectors of a matrix, apply Cayley-Hamilton theorem to determine inverse and power of a matrix and identify the nature of the quadratic form.
3. Solve the differential equations of first order and first degree related to various engineering fields.
4. Find the complete solution to the higher order linear differential equations and apply these methods to find the current in complex electrical circuits.
5. Apply the technique of Laplace transform and solve differential equations for analytical solutions with the initial conditions.

UNIT–I: Solving System of Linear Equations (8 Lectures)

Rank of a matrix by Echelon form-Normal form- Normal form through PAQ method – Solving system of homogeneous and non-homogeneous linear equations – Gauss elimination – Gauss Jordon methods.

UNIT–II: Eigen values – Eigenvectors, Cayley-Hamilton Theorem and Quadratic forms (10 Lectures)

Eigen values - Eigenvectors– Properties – Cayley-Hamilton theorem (without proof) - Finding inverse and power of a matrix by Cayley-Hamilton theorem–Reduction to Diagonal form. Quadratic forms: Rank, index, signature and nature of the

quadratic forms–Reduction of quadratic form to canonical forms by orthogonal transformation.

UNIT–III: Differential Equations of First Order and First Degree (10 Lectures)

Linear differential equation - Bernoulli's differential equation–Exact equations and equations reducible to exact form.

Applications: Newton's Law of cooling-Law of natural growth and decay-Orthogonal trajectories-Electrical circuits.

UNIT–IV: Linear Differential Equations of Higher order (8 Lectures)

Non-homogeneous equations of higher order with constant coefficients-with RHS term of the type e^{ax}, $sinax$, $cosax$, polynomials in x, $e^{ax}V(x)$, $x^nV(x)$ and general method - Method of Variation of parameters.

Applications: LCR circuit

UNIT–V: Laplace Transforms (9 Lectures)

Laplace transforms of standard functions– First shifting Theorem-Change of scale property multiplication by t^n–division by t, transforms of derivatives and integrals – Second shifting theorem– Laplace transform of Periodic functions.

Inverse Laplace transforms – Convolution theorem (without proof)

Applications: Evaluation of integrals using Laplace transforms - Solving ordinary differential equations (Initial value problems) using Laplace transforms.

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44^{th} Edition, Khanna Publishers
2. B.V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10^{th} Edition, Wiley-India.
2. H. K. Das, Advanced Engineering Mathematics, 22^{nd} Edition, S. Chand & Company Ltd.
3. David Poole, Linear Algebra- A modern introduction, 4^{th} edition, Cengage.
4. Peter O' Neil, Advanced Engineering Mathematics, Cengage
5. Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.

Web Resources:

1. `http://tutorial.math.lamar.edu/Classes/DE/DE.aspx`
2. `http://mathworld.wolfram.com/topics`
3. `http://www.nptel.ac.in/course.php`

Course Code	Course Name	Course Structure			
		L	T	P	C
P21BST04	Applied Chemistry	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Basic Chemistry at Intermediate or equivalent level.

Course Objectives: The student will be able

1. To analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers.
2. To utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion.
3. To understand various synthetic methods of nonmaterials for modern advances of engineering technology. Summarize the preparation of semiconductors; analyze the applications of liquid crystals and superconductors
4. To analyze the principles of different analytical instruments and their applications.
5. To Design models for energy by different natural sources.

Course Outcomes: After going through this course the student will be able to

1. Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers.
2. Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion.
3. Understand various synthetic methods of nonmaterials for modern advances of engineering technology. Summarize the preparation of semiconductors; analyze the applications of liquid crystals and superconductors
4. Analyze the principles of different analytical instruments and their applications.
5. Design models for energy by different natural sources.

UNIT–I: Polymer Technology (9 Lectures)

Polymerization: Introduction, classification, methods of polymerization (Emulsion and Suspension), mechanical properties.

Plastics: Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties and applications (Poly ethylene, PVC, Polycarbonates and Bakelite).

Elastomers: Introduction, preparation, properties and applications (Buna S, Thiokol and Polyurethanes).

Composite materials: Fiber reinforced plastics, conducting polymers, biodegradable polymers,

UNIT–II: Electrochemical Cells and Corrosion (10 Lectures)

Galvanic Cells, Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, construction of glass electrode, batteries (Dry cell, Li ion battery, Lead Acid battery and Ni-Cd cells).

Corrosion: Definition, theories of corrosion (Chemical and Electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, corrosion control (Proper designing and cathodic protection), protective coatings (Surface preparation, Cathodic coatings, Anodic coatings, Electroplating and Electroless plating).

UNIT–III: Chemistry of Advanced Materials (10 Lectures)

Nano materials: Introduction, sol-gel method, characterization by (Brunauer Emmet Teller (BET), and transmission electron microscopy (TEM) with example (TiO2), applications of fullerenes, carbon nanotubes (types, preparation and applications).

Liquid crystals: Introduction-types-applications.

Super conductors: Type –I, Type II-characteristics and applications

Non-elemental semiconducting materials: Stoichiometric, controlled valency & chalcogen photo/ semiconductors preparation of semiconductors (zone refining, Czochralski crystal pulling, epitaxy, diffusion, ion implantation)– semiconductor devices (p-n junction diode as rectifier, junction transistor).

UNIT–IV: Spectroscopic Techniques & Synthesis Of Essential Drug Molecules (9 Lectures)

Spectroscopic Techniques: Electromagnetic spectrum-types of molecular spectra and their absorption criteria ,UV-visible spectroscopy (electronic spectroscopy), Beer-Lambert's law and its limitations ,– applications of UV visible spectroscopy ,IR spectroscopy principle, Molecular vibrations – stretching and bending vibrations – applications of IR, NMR (Nuclear magnetic resonance)–working principle and instrumentation of NMR, chemical shift(δ) – applications of NMR

Synthesis of essential drug molecules: Preparation, properties and uses of Paracetamol , Aspirin, Ibuprofen

UNIT–V: Non-Conventional Energy Sources (7 Lectures)

Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.

Text Books:

1. P.C. Jain and M. Jain "Engineering Chemistry", 15/e, Dhanpat Rai & Sons, Delhi, (Latest edition).
2. Shikha Agarwal, "Engineering Chemistry", Cambridge University Press, New Delhi, (2019).
3. S.S. Dara, "A Textbook of Engineering Chemistry", S.Chand & Co, (2010).
4. Shashi Chawla, "Engineering Chemistry", Dhanpat Rai Publicating Co. (Latest edition).

Reference Books:

1. K. SeshaMaheshwaramma and MridulaChugh, "Engineering Chemistry", Pearson India Edition.
2. O.G. Palana, "Engineering Chemistry", Tata McGraw Hill Education Private Limited, (2009).
3. CNR Rao and JM Honig (Eds) "Preparation and characterization of materials" Academic press, New York (latest edition).
4. B. S. Murthy, P. Shankar, "Textbook of Nanoscience and Nanotechnology", University press (latest edition).

Web Resources:

1. http://jntuk-coeerd.in/
2. http://en.wikipedia.org/wiki/title
3. http://nptel.ac.in/coures/105106/.com
4. https://en.wikipedia.org/wiki/Electrochemistry
5. https://www.youtube.com/watch?v=WLyaZbT97EI&list=PLzW3l18TEXrpqo3jRarGr9ao-61tB2184
6. https://encyclopedia.che.engin.umich.edu/
7. http://encyclopedia.che.engin.umich.edu/Pages/ProcessParameters/Spectrometers/Spectrometers.html

Course Code	Course Name	Course Structure			
		L	T	P	C
P21EST03	C - Programming for Problem Solving	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Nill

Course Objectives: The student will be able

1. To impart adequate knowledge on the need of programming languages and problem solving techniques.
2. To impart problem solving skills.
3. To enable student to write programs in C and to solve the problems.

Course Outcomes: After going through this course the student will be able to

1. Design algorithms and flowchart / Pseudo code for a given problem.
2. Design programs involving decision structures and loops.
3. Implement different operations on arrays and solve problems using functions.
4. Understand pointers and strings.
5. Implement structures, unions and file operations in C programming for a given application problem.

UNIT–I **(8 Lectures)**

Introduction to Programming: Computer hardware, Bits and Bytes, programming languages, application and system software, the software development process.

Idea of algorithm: steps to solve logical and numerical problems. Representation of algorithm: flowchart/pseudo code with examples, from algorithms to programs.

UNIT–II **(9 Lectures)**

Introduction to C: Overview of C, Constants, Variables and Data Types, Operators and Expressions, Managing Input and Output. Decision Making - Branching and Looping. Enumerated Data type, Renaming Data type with type def, Type Casting.

UNIT–III **(10 Lectures)**

Arrays: Definition, Declaration, Initialization, Assignment, Processing array, Passing array to a function, Two and multi dimensional array. **Functions:** Defining a function, Accessing a function, Passing argument to functions, Function prototypes, Nested function call, Storage classes.

UNIT–IV **(9 Lectures)**

Pointers: Definition, initialization, operations on pointers, functions and pointers, arrays and pointers, pointers to pointers, dynamic memory allocation.

Strings: C Strings, String Input / Output functions, arrays of strings, string manipulation functions.

UNIT–V **(9 Lectures)**

Structures: Definition, declaration, initialization, accessing members, array of structures, arrays within structure, functions and structures, pointers to structures, nested structures, unions.
File Handling: Types, operations on files, modes, file I/O functions, Random Access Functions.

Text Books:

1. Byron S Gottfried, —Programming with C, Schaums Outlines, Second Edition, Tata McGraw-Hill, 2006.
2. Problem Solving and Program Design in C, 4th edition, by jeri R. Hanly and Elli B.Koffman.
3. Balagurusamy. 2011. C Programming. Tata Mc Graw Hills, New Delhi, India.

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. Yashavant P. Kanetkar. —Let Us C, BPB Publications, 2011.

Web Resources:

1. https://www.studytonight.com/c/
2. https://www.cprogramming.com/tutorial/c-tutorial.html
3. https://www.javatpoint.com/c-programming-language-tutorial
4. https://www.tutorialspoint.com/cprogramming/

Course Code	Course Name	Course Structure			
		L	T	P	C
P21EST04	Computer Engineering Workshop	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: NILL

Course Objectives:

1. To make the students aware of the basic hardware components of a computer and installation of operating system.
2. To introduce Raptor Tool for flowchart creation.
3. To introduce programming through Visual Programming tool using scratch.
4. To get knowledge in awareness of cyber hygiene that is protecting the personal computer from getting infected with the viruses, worms and other cyber-attacks.
5. To introduce the usage of Productivity tools in crafting professional word documents, excel spreadsheets and power point presentations using open office tools.

UNIT–I:

Simple Computer System: Central processing unit, the further need of secondary storage, Types of memory, Hardware, Software and people. Peripheral Devices: Input, Output and storage, Data Preparation, Factors affecting input, Input devices, Output devices, Secondary devices, Communication between the CPU and Input/ Output devices.

TASK 1: PC Hardware: PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers. In addition hardware and software level troubleshooting process, tips and tricks would be covered. Every student should identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor. Every student should disassemble and assemble the PC back to working condition.

TASK 2: Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition.

Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition.

UNIT–II:

Problem Solving and Programming: Algorithm development, Flowcharts, Looping, some programming features, Pseudo code, the one-zero game, some structured programming concepts, documents. Programming Languages: Machine Language

and assembly language, high –level and low level languages, Assemblers, Compilers, and Interpreters.

TASK 3: Drawing flowcharts (Raptor Tool)

a) Create flowcharts for take-off landing of an Aeroplane.

b) Create a flowchart to validate an email id entered by user.

c) Create flowchart to print first 50 prime numbers.

TASK 4: Productivity tool:LaTeX and Microsoft (MS) office: Importance of MS office, Details of the three tasks and features that should be covered in each, MS word, Power Point, Excel.

UNIT–III:

Operating systems: Introduction, Evolution of operating systems, , Command Interpreter, Popular operating systems- Microsoft DOS, Microsoft Windows, UNIX and Linux. Introduction to Unix Shell Commands, directory management commands, file operations, users commands, Time and Date commands.

TASK 5: Operating System Installation: Every student should individually install operating system like Linux or MS windows on the personal computer. The system should be configured as dual boot with both windows and Linux.

TASK 6: Basic Commands: Unix Shell Commands, directory management commands, file operations, users commands, Time and Date commands.

UNIT–IV:

Computer Networks: Introduction to computer Networks, Network topologies-Bus topology, star topology, Ring topology, Mesh topology, Hybrid topology, Types of Networks: Local area Network, Wide Area Networks, Metropolitan Networks, Campus/ Corporate Area Network, Personal Area Network, Network Devices- Hub, Repeater, Switch, Bridge, Router, Gateway, Network interface Card, Basic Networking Commands.

TASK 7: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IPsetting. Finally students should demonstrate how to access the websites and email.

TASK 8: Networking Commands: ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp, wget,route

UNIT–V:

Introduction to HTML : Basics in Web Design, Brief History of Internet ,World Wide Web Why create a web site ,Web Standards, HTML Documents ,Basic structure of an HTML document Creating an HTML document ,Mark up Tags ,Heading-Paragraphs ,Line Breaks ,HTML Tags. Elements of HTML: Introduction to elements of HTML, Working with Text, Working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia, Working with Forms and controls.

TASK 9: Basic HTML tags

a) Head Section and Elements of Head Section, Paragraphs, Formatting Styles.

b) Colour tags, Creating Hyperlinks, Images, Tables, lists

c) HTML Forms, Form Attributes, Form Elements.

TASK 10: Web Browsers, Surfing the Web: Students customize their web browsers

with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured. Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. Usage of search engines like Google, Yahoo, ask.com and others should be demonstrated by student.

TASK 11: Cyber Hygiene: Students should learn about viruses on the internet and install antivirus software. Student should learn to customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

Text Books:

1. Fundamentals of Computers –ReemaThareja-Oxford higher education
2. Computer Fundamentals, Anita Goel, Pearson Education, 2017
3. PC Hardware Trouble Shooting Made Easy, TMH
4. Programming the World Wide Web, 7^{th} Edition, Robet W Sebesta, Pearson, 2013.

Reference Books:

1. An Introduction to Web Design, Programming, 1^{st} Edition, Paul S Wang, Sanda S Katila, Cengage Learning, 2003.
2. An Introduction to Computer studies –Noel Kalicharan-Cambridge

Course Code	Course Name	Course Structure			
		L	T	P	C
P21HSL01	English Language Communication Skills Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: Basic knowledge of English grammar, Basic understanding of English vocabulary, Ability to speak simple sentences, Have interest to learn the language.

Course Objectives: The student will be able

1. To facilitate computer assisted multimedia instructions enabling individualized and independent language learning.
2. To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm.
3. To bring about a consistence accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking.
4. To improve the fluency of students in spoken English and neutralize their mother tongue influence.
5. To train students to use language appropriately for public speaking, group discussion and interviews.

Course Outcomes: After going through this course the student will be able to

1. Better understanding of nuances of English language through audio visual experience and group activities.
2. Neutralization of accent for intelligibility.
3. Speaking skills with clarity and confidence which in turn enhances their employability skills.
4. Better understanding of the production of sounds of language.
5. Suitable body language for employability.

EXERCISE–I **(3 Sessions)**

A. Introduction to Phonetics
   Consonant sounds
   Vowel sounds – Pure Vowels & Diphthongs

B. Greeting, Introducing & taking leave and Ice – Breaking Activity

EXERCISE–II **(2 Sessions)**

A. Structure of Syllables - Plural markers & Past tense Markers

B. JAM Session & Situational Dialogues

EXERCISE–III **(2 Sessions)**

A. Word Stress & Rules of 'r' pronunciation

B. Role play, Giving Directions & Story Narration

EXERCISE–IV **(2 Sessions)**

A. Consonant Cluster, Neutralization of Mother Tongue Influence and Listening Comprehension – Listening for General Details

B. Describing objects, events, places etc. & Presentation Skills – Extempore, Public Speaking.

EXERCISE–V **(3 Sessions)**

A. Intonation & Listening Comprehension – Listening for Specific Details

B. Interview Skills & Group Discussion

Text Books:

1. Strengthen your Communication Skills - Maruthi Publication, Hyderabad 2013
2. A textbook of English Phonetics for Indian Students by T. Balasubramanian (Macmillan)

Reference Books:

1. INFOTECH English (Maruthi Publications).
2. Personality Development and Soft Skills (Oxford University Press, New Delhi)
3. Suresh Kumar, E. & Sreehari, P. 2009. A Handbook for English Language Laboratories. New Delhi: Foundation
4. Speaking English Effectively 2^{nd} Edition by Krishna Mohan and N. P. Singh, 2011. Macmillan Publishers India Ltd. Delhi.
5. Sasi Kumar, V & Dhamija, P.V. How to Prepare for Group Discussion and Interviews. Tata McGraw Hill
6. Hancock, M. 2009. English Pronunciation in Use. Intermediate. Cambridge: CUP
7. Spoken English: A Manual of Speech and Phonetics by R. K. Bansal & J. B. Harrison. 2013. Orient Blackswan. Hyderabad
8. Hewings, M. 2009. English Pronunciation in Use. Advanced. Cambridge: CUP
9. Marks, J. 2009. English Pronunciation in Use. Elementary. Cambridge: CUP
10. Nambiar, K.C. 2011. Speaking Accurately. A Course in International Communication. New Delhi : Foundation

11. Soundararaj, Francis. 2012. Basics of Communication in English. New Delhi: Macmillan

12. Spoken English (CIEFL) in 3 volumes with 6 cassettes, OUP.

13. English Pronouncing Dictionary Daniel Jones Current Edition with CD.

Web Resources:

1. http://www.cambridge.org
2. http://www.edufind.com/english/practice
3. http://www.learnenglish.com
4. http://www.penguin.co.uk

Course Code	Course Name	Course Structure			
		L	T	P	C
P21BSL03	Applied Chemistry Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: Basic Chemistry at Intermediate or equivalent level.
Course Objectives: The purpose of this course to provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.
Course Outcomes: After going through this course the student will be able to

1. Carrying out different types of titrations for estimation of concerned in materials using comparatively more quantities of materials involved for good results.
2. Handling different types of instruments for analysis of materials using small quantities of materials involved for quick and accurate results.

LIST OF EXPERIMENTS: Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis.

1. Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of water sample containing Na_2CO_3 and NaOH.
3. Determination of Mn^{+2} using standard oxalic acid solution.
4. Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.
5. Determination of Cu^{+2} using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Fe^{+3} by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (p^Hmetry method).
9. Determination of isoelectric point of amino acids using p^Hmetry method (or) conductometric method.
10. Determination of the concentration of strong acid vs strong base (by conductometric method).
11. Determination of strong acid vs strong base (by potentiometric method).
12. Estimation of Vitamin C.
13. Preparation of Nylon-6, 6 and Bakelite (demonstration only).

Lab Manual: Engineering/Applied Chemistry Lab Manual, Department of Chemistry, Pace Institute of Technology and Science, Vallur, Prakasam(Dt.), Andhra Pradesh, India.
Reference Books:

1. Dr. Jyotsna Cherukuris (2012) Laboratory Manual of engineering chemistry-II,

2. VGS Techno Series 3. Chemistry Practical Manual, Lorven Publications

Web Resources:

1. https://vlab.amrita.edu/index.php?sub=2&brch=193.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21ESL02	C - Programming for Problem Solving Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: Nil

Course Objectives: The student will be able

1. To understand the various steps in program development.
2. To understand the basic concepts in C Programming Language.
3. To understand different modules that includes conditional and looping expressions.
4. To understand how to write modular and readable C Programs.
5. To write programs in C to solve problems using arrays, structures and files.

Course Outcomes:

1. Apply and practice logical ability to solve the problems.
2. Understand C programming development environment, compiling, debugging, and linking and executing a program using the development environment.
3. Analyzing the complexity of problems, modularize the problems into small modules and then convert them into programs.
4. Understand and apply the in-built functions and customized functions for solving the problems.
5. Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.
6. Document and present the algorithms, flowcharts and programs in form of user-manuals

Experiment Wise Programs

Experiment–I

a. Write a simple C program to Print “Hello World”

b. Write a simple C Program to Calculate Area and Circumference of Circle

c. Write a simple C program to implement basic arithmetic operations - sum, difference, product, quotient and remainder of given numbers.

Experiment–II: Write C programs to demonstrate the following operators

a. Assignment Operator.

b. Relational and Logical Operator.

c. Increment and decrement operator.

d. Bitwise operators.

e. Ternary operator.

Experiment–III

a. Write a C programs - to find the largest and smallest of 2 numbers(if – else), to find the largest and smallest of 3 numbers(Nested if – else), roots of quadratic equation(else – if ladder).

b. The total distance travelled by vehicle in't' seconds is given by distance=ut+1/2 at 2 where 'u' and 'a' are the initial velocity and acceleration.

   Write a c program to find the distance travelled at regular intervals of time given the Values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.

c. Write a c program, which takes two integer operands and one operator from the user, performs the operation and the prints the result. (consider the operators $+, -, *, /, \%$ and use switch statement).

Experiment–IV

a. Write a C program to find the sum of individual digits of a positive integer

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

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

Experiment–V

a. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: $1 + x + x^2 + x^3 + ... + x^n$

b. Write a C program to generate Pascal's triangle.

c. Write a C program to construct a pyramid of numbers

Experiment–VI

a. Write a c program to find both the largest and smallest number in a list of integers.

b. Write a c program that uses functions to perform the following:

   i. Addition of Two Matrices.

   ii. Multiplication of Two Matrices.

Experiment–VII

a. Write a programs that use both recursive and non-recursive functions

b. To find the factorial of a given integer.

c. To find the GCD of two given integers.

Experiment–VIII

a. Write a c program that uses functions to perform the following operations:

   i. To insert a sub-string in given main string from a given position.

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

b. Write a C program to determine if the given string is a palindrome or not.

Experiment–IX

a. Write a C program that displays the position or index in the string S Where the string T begins, or - 1 if S doesn't contain T.

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

Experiment–X

a. Write a program to print the details of a student like(Name, Rollno, marks) using nested structures.

b. Write a C Program to Calculate Difference Between Two Time Period.

Experiment–XI

a. Write a C program that uses functions to perform the following operations:

   i. Reading a complex number

   ii. Writing a complex number

   iii. Addition of two complex numbers

   iv. Multiplication of two complex numbers
   (Note: represent complex number using a structure.)

Experiment–XII

a. Write a C program which copies one file to another and display the contents of a file

b. Write a C program to reverse the first n characters in a file.

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

Course Code	Course Name	Course Structure			
		L	T	P	C
P21BST06	Numerical Methods & Vector Calculus	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Differentiation, Partial differentiation, Integration, Differential Equations

Course Objectives: The student will be able to

1. The different numerical techniques to solve algebraic and transcendental equations and evaluate the polynomials from the numerical data.
2. The approximate solutions using numerical methods in the absence of analytical solutions of various systems of ordinary differential equations and integrations.
3. Enhance the knowledge level to visualize integrals in higher dimensional coordinate systems, possible representation and evaluation of geometrical and physical quantities in terms of multiple integrals.
4. Interpret concepts of vector functions, vector fields, differential calculus of vector functions in Cartesian coordinates and apply them for various engineering problems.
5. Evaluate line, surface and volume integrals and construct relation between line, surface and volume integrals using vector integral theorems.

Course Outcomes: After going through this course the student will be able to

1. Evaluate approximate roots of the polynomial and transcendental equations by different algorithms and apply Newton's forward, backward interpolation and Lagrange's formulae for equal and unequal intervals.
2. Apply different algorithms for approximating the integrals of numerical data and solutions of ordinary differential equations to its analytical computations.
3. Evaluate the multiple integrals by using change of variables and change of order of integration. Also apply double and triple integration techniques in evaluating areas and volumes bounded by regions and solids.
4. The physical meaning of different operators such as gradient, curl and divergence.
5. Determine line, surface and volume integrals. Apply Green's, Stoke's and Gauss divergence theorems to calculate line, surface and volume integrals.

UNIT–I: Iterative Methods, Finite differences and Interpolation (10 Lectures)

Introduction-Solution of algebraic and transcendental equations-Bisection method -Method of false position-Newton-Raphson method (Single variable only)

Interpolation: Introduction-Errors in polynomial interpolation-Finite differences – Forward differences-Backward differences-Relations between operators-Newton's forward and backward formulae for interpolation -Interpolation with unequal intervals -Lagrange's interpolation formula.

UNIT–II: Numerical integration, Solution of ordinary differential equations with initial (9 Lectures)

Trapezoidal rule – Simpson's 1/3rd and 3/8th rule– Solution of ordinary differential equations by Taylor's series – Picard's method of successive approximations – Euler's method – Modified Euler's method-Runge-Kutta method (second and fourth order).

UNIT–III:Multiple Integrals: (9 Lectures)

Double integrals (Cartesian and Polar) – Change of order of integration – Change of variables (Cartesian to Polar coordinates) –Triple integrals- Change of variables (Cartesian to Cylindrical and Spherical coordinates).

Applications: Areas by double integrals and Volumes by triple integrals.

UNIT–IV: Vector Differentiation: (8 Lectures)

Scalar and Vector point functions-Vector Differential operator- Gradient – Directional derivatives – Divergence – Curl – Laplacian second order operator- Vector identities- Applications: Scalar Potential function.

UNIT–V: Vector Integration: (9 Lectures)

Line integral – Work done – Circulation- Surface integral- Volume integral

Vector Integral Theorems (without proof): Application of Green's theorem in a plane- Stoke's theorem- Gauss Divergence theorem.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, 44^{th} Edition, Khanna Publishers.
2. B.V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10^{th} Edition, Wiley-India.
2. H. K. Das, Advanced Engineering Mathematics, 22^{nd} Edition,S. Chand & Company Ltd.
3. David Poole, Linear Algebra- A modern introduction, 4^{th} edition, Cengage.
4. Peter O' Neil, Advanced Engineering Mathematics, Cengage
5. Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.

Web Resources:

1. `http://tutorial.math.lamar.edu/Classes/DE/DE.aspx`
2. `http://mathworld.wolfram.com/topics`
3. `http://www.nptel.ac.in/course.php`

Course Code	Course Name	Course Structure			
		L	T	P	C
P21BST02	Applied Physics	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: The basics of analytical and conceptual understanding of physics

Course Objectives: The student will be able

1. To study the wave nature of light through Interference and diffraction.
2. To learn the basic principles of Lasers and fiber optics.
3. To express the physics of electrostatics and electromagnetic wave concepts through Maxwell's equations.
4. To study the basic concepts of Quantum mechanics.
5. Aware of limits of classical free electron theory and apply band theory of solids.
6. Acquire the knowledge of semiconductor physics.

Course Outcomes: After going through this course the student will be able to

1. Understanding the basic concepts of optics and how to apply them for engineering applications.
2. Acquire the knowledge of fundamentals of Lasers and fiber optics enables the students to develop Laser devices to apply them in various systems like communications, Industries and medicine.
3. Set students to be exposed to Electrostatics, Maxwell's equations, electromagnetic waves and fundamental concepts of quantum mechanics.
4. Enable to learn the fundamental concepts of free electron theory and band theory of solids.
5. Develop knowledge of band theory of solids for fundamentals of Semiconductor physics enables the students to apply the knowledge to various systems like communications, solar cell, photo cells and so on.

UNIT–I: Wave Optics (9 Lectures)

Interference: Introduction, Principle of Superposition of waves, colors in thin films, interference in thin films, Newton's rings: Determination of wavelength and refractive index.

Diffraction: Introduction, differences between interference and diffraction, difference between Fraunhofer and Fresnel's diffraction, Fraunhofer diffraction at single slit, Fraunhofer diffraction due to double slit, Diffraction grating (N-slits qualitative), resolving power of grating.

UNIT–II: Lasers and Fiber Optics (9 Lectures)

Lasers: Introduction, Characteristics of laser, absorption, spontaneous emission, stimulated emission, Einstein's coefficients, population inversion, pumping, pumping mechanisms, Types of Lasers: Ruby laser, He-Ne laser, diode laser, Applications of Lasers.

Fiber optics: Introduction, Total internal reflection-wave propagation in optical fiber, Acceptance angle, numerical aperture, applications of optical fiber.

UNIT–III: Electrostatics, Maxwell's Equations and Electromagnetic Waves (9 Lectures)

Electrostatics: Coulombs law, electric field, electric field intensity, electric flux density, electrostatic potential, divergence of electric field, Laplace's and Poisson's equations for electrostatic potential, Gauss theorem in electrostatics.

Maxwell's equations and electromagnetic waves: Gauss theorem in magneto statics, Faraday's law of electromagnetic induction, Ampere's law, displacement current, Maxwell's equations in vacuum, electromagnetic wave equation in dielectric medium, velocity of propagation of electromagnetic wave, poynting vector and poynting theorem.

UNIT–IV: Quantum Mechanics, Free Electron Theory and Band Theory (10 Lectures)

Quantum Mechanics: Introduction to quantum physics, de-Broglie's hypothesis and properties of matter waves, Schrodinger's time independent wave equation, Schrodinger's time dependent wave equation, Particle in one dimensional box.

Free electron theory: classical free electron theory of metals- assumptions and failures, quantum free electron theory of metals-assumptions and failures, Fermi Dirac distribution function- Fermi level, Femi energy, density of states.

Band theory of solids: Introduction, Bloch's theorem, Kronig penny model (qualitative), E-K diagram, Brillouin's zones, classification of solids into metals, semiconductors and insulators, effective mass of electron and concept of hole.

UNIT–V: Semiconductor Physics (8 Lectures)

Semiconductor physics: Introduction, intrinsic and extrinsic semiconductors, carrier concentration in intrinsic semiconductors, electrical conductivity of intrinsic semiconductor, Fermi energy, carrier concentration in N-type and P-type semiconductors, dependence of Fermi energy on carrier-concentration and temperature, drift and diffusion, Hall effect and its applications, mechanism in LED, solar cell and photo conductor.

Text Books:

1. A Textbook of Engineering Physics by Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand.
2. Optics by Ajoy Ghatak, Tata McGraw-Hill Publishing company limited
3. Introduction to Electrodynamics by David Griffiths, Cambridge University Press
4. Introduction to Quantum physics by Eisberg and Resnick.

Reference Books:

1. Applied physics by Palanisamy (Scitech publications)
2. Optics by Eugene Hecht, Pearson Education.
3. Principle of Lasers by O. Svelto
4. Electricity, magnetism and light by W. Saslow
5. Semiconductor Optoelectronics by J. Singh, Physics and Technology, Mc Graw-Hill inc
6. Engineering Physics by B.K. Pandey, S. Chaturvedi - Cengage Learing.

Web Resources:

1. https://nptel.ac.in/courses/115/106/115106066/
2. https://ocw.mit.edu/high-school/physics/exam-prep/electromagnetism/maxwells-equations/#1
3. https://ocw.mit.edu/courses/materials-science-and-engineering/3-091sc-introduction-to-solid-state-chemistry-fall-2010/electronic-materials/14-semiconductors/

Course Code	Course Name	Course Structure			
		L	T	P	C
P21EST12	Digital Electronics	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: NILL

Course Objectives:

1. Relate the conversion among different number systems.
2. Outline of basic logic gates – AND, OR & NOT, XOR, XNOR and understand Boolean algebra and basic properties of Boolean algebra.
3. Able to optimize simple logic using Karnaugh maps, understand "don't care" concepts.
4. Design simple combinational using basic gates.
5. Understand different memories and able to design different programmable devices.

Course Outcomes:

1. Demonstrate the various number systems and conversion of number systems.
2. Develop Boolean algebra & the underlying features ofvarious logic gates.
3. Conceptualize Design mapping method upto 4-variables.
4. Apply the concepts of Boolean algebra for the analysis & design of various combination logic circuits.
5. Able to compare different memories and their programmable devices.

UNIT–I: (9 Lectures)

Number Systems and Binary Codes : Number System, Types of Number Systems, Number base Conversions from one radix to another radix, Representation of Signed Binary Numbers,1's complement arithmetic, 2's complement arithmetic. Gray code, Excess-3 code, BCD code. Conversions.

UNIT–II: (9 Lectures)

Boolean algebra : Logic gates, Laws of Boolean algebra, Principle of Duality, Principle of Complements, Reducing Boolean Expressions using Boolean algebra, Canonical and Standard Forms, M- Notations: Minterms and Maxterms.

UNIT–III: (9 Lectures)

Gate level Minimization : Map Method, Two-Variable K-Map, Three-Variable K-Map, Four Variable K-Maps: Sum of Products Simplification, Products of Sum Simplification, Don't – Care Conditions. Implementation using NAND and NOR.

UNIT–IV: (9 Lectures)

Combinational Logic Design: Introduction, Design Procedure, Adders, Subtractors, Binary Adder–Subtractor, Decoders, Encoders, Multiplexers and Demultiplexers.

UNIT–V: **(9 Lectures)**

Programmable Logic Devices: Classification of memories, PROM,PAL,PLA – basic Structures, Realization of Boolean function with PLDs , Comparison of PROM, PAL, PLA.

Text Books:

1. Digital Design, 5/e, M.Morris Mano, Michael D Ciletti, PEA, 2011.
2. Fundamentals of Logic Design, 5/e, Roth, Cengage, 2010.
3. A.K.Singh,Digital Logic Circuits, New Age International Publishers.

Reference Books:

1. Switching Theory and Logic Design, A.Anand Kumar, 2016.
2. Digital Electronics and Logic Design, Dr. Sanjay Sharma, 2010.
3. Modern Digital Electronics, R.P. Jain, TMH, 2010.

Web Resources:

1. www.researchgate.net
2. www.digital-logic-design.en.softonic.com
3. https://nptel.ac.in/courses/117/106/117106086/
4. https://www.coursera.org/learn/digital-systems

Course Code	Course Name	Course Structure			
		L	T	P	C
P21EST13	Data Structures	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: C Programming

Course Objectives: The student will be able to

1. Comprehensive knowledge of data structures and ability to implement the same in software applications.
2. Exposure to algorithmic complexities, recursive algorithms, searching techniques.
3. Exposure to sorting technique, Applying stack techniques for logical operations.
4. Applying queue techniques for logical operations, Exposure to list representation models in various types of applications.
5. Implementation of tree in various forms, Advanced understanding of other variants of trees and their operations.
6. Orientation on graphs, representation of graphs, graph traversals, spanning trees Graphs.

Course Outcomes: After going through this course the student will be able to

1. Student will be able to choose appropriate data structure as applied to specified problem definition.
2. Implement appropriate sorting/searching technique for given problem
3. Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures.
4. Students will be able to implement Linear and Non-Linear data structures
5. Analyze variety of Graph data structures that are used in various applications.

UNIT–I: (9 Lectures)

Data Structure, Recursion & Searching: Preliminaries of algorithm, Algorithm analysis and complexity. Data Structure: Definition, types of data structures. **Recursion:** Definition, Design Methodology and Implementation of recursive algorithms, Types of recursion (Linear, binary and Tail), recursive algorithms for factorial function, GCD Computation, Fibonacci sequence.

Searching: List Searches using Linear Search, Binary Search.

UNIT–II: (10 Lectures)

Sorting Techniques: Basic Concepts, Sorting by: Insertion (Insertion Sort), Selection (heap sort), Exchange(Bubble sort, Quick Sort) Merging(Merge sort) Algorithms.

Stacks: Basic Stack operations, Representation of a stack using arrays, Stack Applications: Reversing list, Infix to postfix transformation.

UNIT–III: (10 Lectures)

Queues: Introduction, Representation of a Queue using arrays, Queue Operations, Applications of queues- Round Robin Algorithm, Circular Queues, Priority Queues.

Linked List: Introduction, single linked list, representation of a linked list in memory, Operations on a single linked list, Reversing a single linked list, Applications: single linked list to represent polynomial expressions, Double linked list. , Circular linked list

UNIT–IV: (9 Lectures)

Trees: Basic tree concepts, Binary Trees: Properties, Representation of Binary Trees using arrays, operations on a Binary tree, Binary Tree Traversals (recursive).

Advanced Tree Concepts: Binary search tree, Basic concepts, BST operations: Searching, insertion, deletion, Balanced search trees-AVL Trees.

UNIT–V: (7 Lectures)

Graphs: Basic concepts, Graph Representations- Adjacency matrix, Adjacency lists, Graph algorithms: Graph Traversals (BFS & DFS), applications: Dijkstra's shortest path, Minimum Spanning Tree using Prim's & Kruskal's Algorithm.

Text Books:

1. Data Structures, 2/e, Richard F, Gilberg , Forouzan, Cengage,2007.
2. Data Structures and Algorithms, G.A.V.Pai, TMH, 2008
3. Data Structures and Algorithms Made Easy, Narasimha Karumanchi , Second Edition, 2011.

Reference Books:

1. Data Structure with C, Seymour Lipschutz, TMH,2010.
2. Classic Data Structures, 2/e, Debasis ,Samanta,PHI,2009
3. Fundamentals of Data Structure in C, 2/e, Horowitz, Sahni, Anderson Freed, University Press.

Web Resources:

1. `www.geeksforgeeks.org`
2. `www.hackr.io.`
3. `www.letsfindcourse.com`

Course Code	Course Name	Course Structure			
		L	T	P	C
P21EST14	Python Programming	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: NILL

Course Objectives:

1. To read and write simple Python programs.
2. 2. To develop Python programs with conditionals and loops.
3. To define Python functions and apply OOP concept.
4. To use Python data structures — lists, tuples, dictionaries.
5. To develop GUI applications in Python.

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

1. Understand the basics of python programming.
2. Understand control flow and implement various data structures provided by python.
3. Implement packages, methods and functions.
4. Develop real-world applications using oops and exception handling.
5. Build GUI Applications in Python.

UNIT–I: (8 Lectures)

Introduction: History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

UNIT–II: (9 Lectures)

Types, Operators and Expressions: Types - Integers, Strings, Booleans, Expressions and order of evaluations, Control Flow- if, if-elif-else, for, while, break, continue, pass.

Data Structures Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences, Comprehensions..

UNIT–III: (10 Lectures)

Functions - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.

Modules: Creating modules, import statement, from. Import statement, name spacing,

Python packages: Introduction to PIP, Installing Packages via PIP, Using Python Packages

UNIT–IV: (9 Lectures)

Object Oriented Programming OOP in Python: Classes, 'self variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding.

Error and Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions.

UNIT–V: (9 Lectures)

Brief Tour of the Standard Library & Files - Operating System Interface - String Pattern Matching, Mathematics, Internet Access, Dates and Times, Data Compression, Multithreading, GUI Programming, Turtle Graphics, file operations.

Text Books:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2^{nd} edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/).
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

Reference Books:

1. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press , 2013
2. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
4. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem Solving Focus, Wiley India Edition, 2013.

Web Resources:

1. `https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/`
2. `https://www.codecademy.com/learn/learn-python`
3. `https://www.codementor.io/collections/learn-python-bwbc63ulz`
4. `http://www.diveintopython3.net/`
5. `https://www.python.org/3/`
6. `https://www.learnpython.org`

Course Code	Course Name	Course Structure			
		L	T	P	C
P21BSL01	Applied Physics Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: The basics of analytical and conceptual understanding of physics.

Course Objectives:

1. Deploy scientific method of experiments in the laboratory.
2. Develop the procedures and observational skills for appropriate use of simple and complex apparatus.
3. Enable analytical techniques, statistical analysis and graphical analysis.
4. Reinforce ideas and concepts covered in lecture host of experiments.
5. Train to find the radius of curvature of a Plano-convex lens forming Newton's rings.

Course Outcomes:

1. Apply the phenomenon of interference and diffraction of light waves.
2. HImplement the concept of resonance in LCR circuit and sonometer.
3. HM toAnalyze the S determine its dependent properties.
4. Evaluate the behavior of electronic components and its characteristics.

LIST OF EXPERIMENTS: (any eight of the following to be done)

1. Determination of Radius of Curvature of Plano-Convex lens by forming Newton's Rings.
2. Determination of Wavelengths of various spectral lines using diffraction grating with the normal incidence method.
3. Study of magnetic field along the axis of a current carrying coil and to verify Stewart-Gee's method.
4. Determination of energy gap of PN junction Diode.
5. Determination of hall coefficient and carrier concentration using Hall effect
6. Study of V-I characteristics of Zener diode.
7. Determination of frequency of a vibrating bar or electrical tuning fork using Melde's apparatus.
8. Determination of acceleration due to gravity using compound pendulum
9. Verification of laws of transverse waves by Sonometer.
10. Determination of Velocity of sound by volume resonator.
11. Determination of rigidity modulus by Torsional Pendulum.

Text Books:

1. Physics lab manual, department of physics, PACE Institute of Technology and Sciences.

2. Madhusudhanrao, "Engineering Physics lab manual" 1^{st} edition, Scietech Publication, 2015.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21ESL06	Data Structures Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: C- Programming

Course Objectives: The objective of this lab is

1. To choose the appropriate data structure and algorithm design method for a specified application.
2. To solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps binary search trees, and graphs and writing programs for these solutions.

Course Outcomes: At the end of the course student can able to

1. Analyze worst-case running times of algorithms using asymptotic analysis and implement various data structures like linked lists.
2. Understand and implement stacks and queues using arrays and linked lists.
3. Analyze and implement various searching and sorting algorithms.
4. Design and implement appropriate hash function and collision-resolution algorithms
5. Experiment with different graph traversal techniques.

List of Experiments:

Experiment 1:

Write recursive program for the following

a. Write recursive C program for calculation of Factorial of an integer
b. Write recursive C program for calculation of GCD (n, m)
c. Write recursive program which computes the n^{th} Fibonacci number

Experiment 2:

a. Write recursive C program for functions to perform Linear search for a Key value in a given list.
b. Write recursive C program for functions to perform Binary search for a Key value in a given list.

Experiment 3:

a. Write C program that implement Bubble sort, to sort a given list of integers in ascending order.
b. Write C program that implement Quick sort, to sort a given list of integers in ascending order

Experiment 4:

a. Write C program that implement Insertion sort, to sort a given list of integers in ascending order
b. Write C program that implement merge sort, to sort a given list of integers in ascending order

Experiment 5:

a. Write C program that implement stack (its operations) using arrays
b. Write C program that implement stack (its operations) using Linked list

Experiment 6:

a. Write a C program that uses Stack operations to Convert infix expression into postfix expression
b. Write C program that implement Queue (its operations) using arrays.
c. Write C program that implement Queue (its operations) using linked lists

Experiment 7:

a. Write a C program that uses functions to create a singly linked list
b. Write a C program that uses functions to perform insertion operation on a singly linked list
c. Write a C program that uses functions to perform deletion operation on a singly linked list.

Experiment 8:

a. Write a C program to Create a Binary Tree of integers
b. Write a recursive C program for Traversing a binary tree in preorder, inorder and postorder.

Experiment 9:

Write a C program for BST operations (insertion, deletion)

Experiment 10:

a. Write a C program for finding minimum spanning tree in a graph by using Prim's algorithm.
b. Write a C program for finding minimum spanning tree in a graph by using Kruskal's algorithm.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21ESL07	Python Programming Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Outcomes: At the end of the course student can able to

1. A Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python.
2. Express different Decision Making statements and Functions.
3. Interpret Object oriented programming in Python.
4. Understand File handling operations.
5. Design GUI Applications.

Experiment 1 - Basics

a. Running instructions in Interactive interpreter and a Python Script
b. Write a program to purpose fully raise Indentation Error and Correct it

Experiment 2 - Operations

a. Write a program to compute distance between two points taking input from the user (Pythagorean Theorem).
b. Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Experiment 3 – Control Flow

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.
c. Write a program using a for loop that loops over a sequence. What is sequence?
d. Write a program using a while loop that asks the user for a number, and prints a count down from that number to zero.

Experiment 4 – Control Flow-Continued

a. Find the sum of all the primes below two million. Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...
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 5 - DS

a. Write a program to count the numbers of characters in the string and store them in a dictionary data structure.

b. Write a program to use split and join methods in the string and trace a birth day with a dictionary data structure.

Experiment 6- DS-Continued

a. Write a program combine lists that combines these lists into a dictionary.
b. Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

Experiment 7 - Files

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.

Experiment 8 - Functions

a. Write a function dups to find all duplicates in the list.
b. b) Write a function unique to find all the unique elements of a list.

Experiment 9 - Functions –Problem Solving

a. Write a function cumulative product to compute cumulative product of a list of numbers.
b. Write a function reverse to reverse a list. Without using the reverse function.
c. Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

Experiment 10 – Multi - D Lists

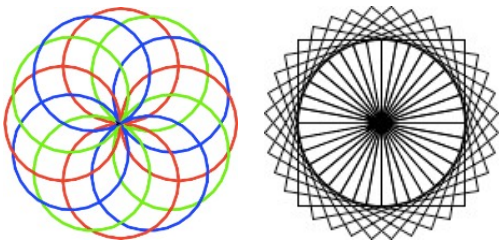
a. Write a program to perform addition of two square matrices.
b. Write a program to perform multiplication of two square matrices.

Experiment 11 - OOP

Class variables and instance variable and illustration of the self variable
i)Robot. ii)ATM Machine.

Experiment - 12 GUI, Graphics

a. Write a GUI for an Expression Calculator using tk.
b. Write a program to implement the following figures using turtle



Course Code	Course Name	Course Structure			
		L	T	P	C
P21BST07	Probability & Statistics	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Principle of counting, Permutations and Combinations.

Course Objectives:

1. To familiarize the students with the foundations of probability and statistical methods.
2. To impart probability concepts and statistical methods in various applications of engineering.

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

1. Explain the basic terms of Statistical Inference.
2. Interpret the association of characteristics and through correlation and regression tools.
3. Make the use of the concepts of probability and their applications. Also apply discrete and continuous probability distributions to solve various engineering problems.
4. Understand the various distribution and sampling and identify the estimation errors in sampling distributions.
5. Apply the proper test statistics to test the hypothetical data by Tests of Hypothesis.

UNIT–I: Descriptive Statistics (9 Lectures)

Introduction - Measures of Central tendency - Measures of Variability (Spread or variance) - Moments – Skewness - Kurtosis.

UNIT–II: Curve Fitting and Correlation and Regression (9 Lectures)

Method of least squares - Straight line - Parabola-Exponential curve - Power curve – Correlation - Correlation coefficient - Rank correlation - Regression and Regression lines.

UNIT–III: Probability Theory and Random Variable: (14 Lectures)

Probability Theory: (14 Lectures)Probability - Axioms of Probability - Elementary theorems - Conditional probability - Baye's theorem (Without Proofs).

Random Variables: Discrete random variable - Distribution function of a discrete random variable - Probability mass function: Properties - Mean and Variance - Continuous random variable - Distribution function - Density function: Properties- Mean and variance.

Probability Distributions: Binomial distribution - Poisson distribution and their fitting to data - Normal distribution - Mean and Variance (Without proof).

UNIT–IV: Sampling theory and Theory of estimation (9 Lectures)

Sampling Theory: Introduction - Population and Samples - Sampling distribution of means (σ known)-Central limit theorem (without proof).

Theory of estimation: Point estimation- Interval estimation - Estimation of one mean and two means - Estimation of one proportion and two proportions.

UNIT–V: Tests of Hypothesis: (9 Lectures)

Introduction – Hypothesis - Null and Alternative Hypothesis - Type I and Type II errors - Level of significance - One tail and two-tail tests -Tests concerning one mean and two means (Large and Small samples) -Tests on proportions.

Text Books:

1. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, 12/e (Reprint) 2020, Sultan Chand & Sons Publications.
2. Miller and Freund's,Probability and Statistics for Engineers,Richard A. Johnson, Irwin Miller, John E. Freund 9/e, Pearson, 2013.

Reference Books:

1. Probability and Statistics, Dr T.K.V. Iyengar & Dr B. Krishna Gandhi & S. Ranganadham & Dr M.V.S.S.N. Prasad S. Chand & Company Ltd, 2016
2. Probability and Statistics for Engineering and the Sciences, Jay L. Devore, 9^{th} Edition, Cengage Learning, 2016.
3. Introduction to probability and statistics Engineers and the Scientists, Sheldon M. Ross,6^{th} Edition, Academic Foundation, 2020.

Web References:

1. `https://leanpub.com/LittleInferenceBook`
2. `https://www.coursera.org/learn/statistical-inference`
3. `https://www.datacamp.com/community/open-courses/statistical-inference-and-data-analysis`

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CST01	Java Programming	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: C Programming

Course Objectives:

1. To understand Object Oriented Programming concepts and basic characteristics of Java
2. To understand the principles of packages, inheritance and interfaces
3. To Implement exceptions and use I/O streams
4. To design and build simple Graphical User Interface application.

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

1. Implement OOPS concepts in Java programs
2. Develop Java programs with the concepts of inheritance and interfaces
3. Design a Java applications using exceptions and I/O streams
4. Develop Java applications using Multithreading
5. Design interactive Java application using swings

UNIT–I: (9 Lectures)

OOPS-Fundamentals: Object Oriented Programming concepts, Benefits of OOP, and Applications of OOP.

Java history, java features, Characteristics of Java, Java Source File –Structure, Compilation, Java keywords, Data Types, Variables and Arrays, Operators, Control Statements.

UNIT–II: (9 Lectures)

OOPS-class, object and Inheritance:

Class fundamentals, declaring objects, assigning object reference variables, introducing methods, overloading methods ,constructors, this keyword, static and final keywords, nested and inner classes.

Inheritance and its types, super keyword, method overriding, defining a package, creation of packages, importing packages, Access specifiers, Abstract classes, Interfaces ,Strings.

UNIT–III: (9 Lectures)

Exception Handling& Streams: Exception handling fundamentals, exception types, uncaught exceptions, using try and catch, multiple catch clauses, throw, throws, finally, creating your own exceptions Stream Classes: Byte Streams- InputStream, OutputStream, FileInputStream, FileOutputStream, Character Streams- Reader, Writer, FileReader, FileWriter.

UNIT–IV: (9 Lectures)

Multithread Programming & Applets: Defining thread, Creating a thread, creating multiple threads, thread life cycle, thread priorities- thread synchronization- Inter-thread communication, daemon threads.

Java Applets- Applet class, Applet structure, An Example Applet Program, Applet Life Cycle, Passing Parameters to Applets.

UNIT–V: (10 Lectures)

Event Handling & Graphics Programming:

Event Handling: The delegation event model- Events, Event Sources, Event Listeners. Event Classes, Event Listener Interfaces, Using the delegation handling the different events.

Graphics programming: Graphics programming, java.awt package, AWT event hierarchy, Frame , Components, Container class, Layouts. Swing Components- Text Fields, Text Areas - Buttons- Check Boxes – Radio Buttons - Lists- choices- Scrollbars - Windows -Menus - Dialog Boxes.

Text Books:

1. Java The complete reference, Herbert Schildt , 10^{th} Edition, McGraw Hill Education, 2017.
2. Core Java Volume –I Fundamentals, Cay S. Horstmann, Gary cornell, 10^{th} Edition, Prentice Hall, 2018.
3. Paul J. Dietel and Dr.Harvey M. Deitel, "Java How to Program", 9^{th} Edition, Prentice- Hall, Pearson Education, 2015.
4. Timothy Budd, "Understanding Object Oriented Programming with Java ", Updated edition, Pearson Education, 2000.
5. Programming with JAVA, E.Balaguruswamy, 5^{th} Edition, McGraw Hill Education, 2010.

Reference Books:

1. Java 2 Black book, Steven Holzner, Dreamtech press, 2005.
2. The JAVA programming language, K. Arnold and J. Gosling, Third edition, Pearson Education, 2000.
3. An introduction to Object-oriented programming with Java, C. Thomas Wu, Fourth Edition, Tata McGraw-Hill Publishing company Ltd., 2010.

Web References:

1. `www.javaworld.com`
2. `www.ibm.com`
3. `www.java.sun.com`

Course Code	Course Name	Course Structure			
P21CST02	Front End Web Technologies	L	T	P	C
		3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Nill

Course Objectives: This course is designed to introduce students with no programming experience to the programming languages and techniques associated with the World Wide Web. The course will introduce web-based media-rich programming tools for creating interactive web pages.

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

1. Interpret a webpage and identify its elements and attributes, Build webpages using HTML5.
2. Make use of Cascading Style Sheets on webpages.
3. Make use of Java Script to write Interactive webpages.
4. Build dynamic webpages with JQuery.
5. Make use of JQuery UI to develop dynamic webpages.

UNIT–I: (8 Lectures)

HTML5: Fundamentals of HTML, working with text, organizing text in HTML, working with Links and URLs, creating tables, working with Images, Colors and Canvas, working with Forms,interactive elements, working with Multimedia.

UNIT–II: (9 Lectures)

Cascading Style Sheets: Overview of CSS3, backgrounds and color gradients in CSS, fonts and text styles, creating boxes and columns using CSS. Displaying, positioning and floating an element, list styles, table layouts, pseudo-classes and pseudo-elements. Effects, frames and controls in CSS, Implementing the advanced features of HTML5.

UNIT–III: (10 Lectures)

Introduction to JavaScript: General syntactic characteristics, primitives, operations, expressions and Control Statements. **Objects in JavaScript:** Object creation and modification, Arrays, Functions. **Dynamic HTML with JavaScript:** Positioning elements, moving elements, element visibility, changing colors and fonts, dynamic content. **Working with Events:** onload, onclick, onsubmit, onmouseover, onmouseout, onkeydown, onkeyup and onkeypress.

UNIT–IV: (9 Lectures)

JQuery API: Introduction: What jQuery can Do, Who Develops jQuery? Obtaining jQuery, Installing jQuery, programming conventions, markup and CSS conventions, JavaScript conventions.

Selecting and Filtering Elements: Using the selectors API, filtering a selection, working within the context of a selection, working with an element's relatives, slicing a selection, adding to a selection. **Events:** The various event wrapper

methods, attaching other events, attaching persistent event handlers, removing event Handlers, creating custom events.

UNIT–V: (9 Lectures)

JQuery UI: HTML5 Drag and Drop: Implementing Drag and Drop, Implementing Drag-and Drop File Uploads, **Sortable:** Making a List Sortable, Customizing Sortable, Saving the State of Sorted Lists, **Selectable, Accordion:** Building an Accordion UI, Changing the Default Pane, Changing the Accordion Event, Setting the Header Elements, **Date picker:** Implementing a Date picker, Localizing the Date picker, **Dialogue:** Implementing a Dialog, Styling a Dialog, Making a Modal Dialog, Auto-Opening the Dialog, Controlling Dynamic Interaction, Animating the Dialog, Working with Dialog Events.

Text Books:

1. Kogent Learning solutions Inc., "HTML 5 Black book", Dreamtech.,2011, (Unit I,II,III).
2. Uttam K Roy, "Web Technologies",Oxford,2010 (Unit IV).
3. Richard York , Web Development with JQuery, Wiley publications, 2/e ,2015 (Unit V)

Reference Books:

1. Robert W Sebesta, "Programming the World Wide Web", 7ed, Pearson, 2012
2. Paul S Wang, Sanda S Katila, "An Introduction to Web Design,Programming", Cengage, 2003.

Web References:

1. `https://www.w3schools.com/`
2. `nptel.ac.in/courses/106105084/13`
3. `https://www.coursera.org`
4. `LearningManagementSystem.`

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CST03	Computer Organization	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: NILL

Course Objectives:

1. Understand the architecture of a modern computer with its various processing units and Performance measurement of the computer system
2. To understand various data transfer techniques in digital computer.
3. To understand the memory management system of computer.

Course Outcomes:

1. Ability to understand basic structure of comTo perform computer arithmetic operations.
2. To understand control unit operations.
3. Evaluate cost performance and design trade-offs in designing and constructing a computer processor Including memory.
4. Ability to understand the concept of cache mapping techniques.
5. Design a pipeline for consistent execution of instructions with minimum hazards.

UNIT–I: (9 Lectures)

Basic Structure of Computers: Organization and Architecture, Structure and Function, Computer Components, Computer Function, Bus Interconnection, Processor Organization, Register Organization.

Basic Computer Organization and Design: Instruction codes, Computer instructions, Memory reference instructions, Instruction Cycle. Central Processing Unit: Stack organization, instruction formats, addressing modes, data transfer and manipulation, program control, RISC.

UNIT–II: (10 Lectures)

Register Transfer and Micro Operations: Register transfer language, Register transfer, Bus and Memory transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit.

Micro Programmed Control: Control Memory, Address Sequencing, Micro Program examples, Design of control unit, Hardwired control.

UNIT–III: (9 Lectures)

Computer Arithmetic: Data representation- Fixed point representation, Floating point representation, Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating-point Representations, Floating-point Arithmetic Operations, Decimal Arithmetic Units, Decimal Arithmetic Operations.

UNIT–IV: (9 Lectures)

Memory Organization: Memory system overview, Memory Hierarchy, Semi-conductor Main Memory, Cache Memory principle, Elements of cache design, Virtual Memory, Magnetic Disk, Optical Memory, Magnetic Tape, RAID.
Input- Output: External Devices, I/O modules, Interrupts, Programmed I/O, Interrupt-driven I/O, Direct Memory Access, I/O Channels and Processors, PCI. Asynchronous Data Transfer, Priority Interrupt, Serial Communication.

UNIT–V: (9 Lectures)

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors.
Multi Processors: Multiprocessors and Multi computers, Characteristics of Multiprocessors, Multiple Processor Organizations, Symmetric Multi-Processors, Cache Coherence, Clusters, Non Uniform Memory Access (NUMA).ons.

Text Books:

1. Computer Systems Architecture, M. Moris Mano, 3^{rd} Edition, Pearson Education, 2007.
2. Computer Organization and Architecture, William Stallings, 10^{th} Edition, Pearson Education, 2016.
3. Computer Architecture and Organization, John P. Hayes, 3^{rd} Edition, McGraw Hill,2012.

Reference Books:

1. Computer Systems Organization and Architecture, John D. Carpinelli, 3^{rd} Edition, Pearson Education, 2001.
2. Computer Organization, V. Carl Hamacher, Zvonko G. Vranesic, Safwat Zaky, 5^{th} Edition, TMH, 2002.

Web References:

1. `www.hackr.io`
2. `www.nptel.ac.in`
3. `www.coursera.org`

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CST04	Software Engineering	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: NILL

Course Objectives:

1. To understand the software life cycle models.
2. To understand the software requirements and SRS document.
3. To understand the importance of modeling and modeling languages.
4. To design and develop correct and robust software products.
5. To understand the quality control and how to ensure good quality software.
6. To understand the planning and estimation of software projects.
7. To understand the implementation issues, validation and verification procedures.
8. To understand the maintenance of software

Course Outcomes:

1. Compare and contrast basic software engineering methods and practices.
2. Analyze the software process models.
3. Analyze the project management essentials.
4. Outline the importance of software testing and quality control approaches.
5. Analyze the Software Reliability and Software Maintenance.

UNIT–I: (9 Lectures)

Software and Software Engineering: The Nature of Software, The Unique Nature of WebApps, Software Engineering, Software Process, Software Engineering Practice, Software Myths.

Process Models: A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Terminology, Product and Process.

UNIT–II: (10 Lectures)

Requirements Analysis And Specification: Requirements Gathering and Analysis, Software Requirement Specification (SRS), Formal System Specification.

Software Design: Overview of the Design Process, How to Characterise of a Design?, Cohesion and Coupling, Layered Arrangement of Modules, Approaches to Software Design

UNIT–III: (9 Lectures)

Function-Oriented Software Design: Overview of SA/SD Methodology, Structured Analysis, Developing the DFD Model of a System, Structured Design, Detailed Design, Design Review, over view of Object Oriented design.

User Interface Design: Characteristics of Good User Interface, Basic Concepts, Types of User Interfaces, Fundamentals of Component-based GUI Development, A User Interface Design Methodology.

UNIT–IV: (9 Lectures)

Coding And Testing: Coding, Code Review, Software Documentation, Testing, Unit Testing, Black-Box Testing, White-Box Testing, Debugging, Program Analysis Tool, Integration Testing, Testing Object-Oriented Programs, System Testing, Some General Issues Associated with Testing

UNIT–V: (9 Lectures)

Software Reliability And Quality Management: Software Reliability, Statistical Testing, Software Quality, Software Quality Management System, ISO 9000, SEI Capability Maturity Model.

Software Maintenance: Software maintenance, Maintenance Process Models, Maintenance Cost, Software Configuration Management.

Text Books:

1. Software engineering A practitioner's Approach, Roger S. Pressman, Seventh Edition, McGrawHill International Edition, 2010.
2. Fundamentals of Software Engineering, Rajib Mall, Fifth Edition, 2018.
3. Software Engineering, Ian Sommerville, Tenth edition, Pearson education, 2016.

Reference Books:

1. Software Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008
2. Software Engineering: A Precise Approach, Pankaj Jalote, Wiley India, 2010.
3. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press, 2008.
4. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition, 2007.

Web References:

1. `https://www.tutorialspoint.com/software_engineering`
2. `https://nptel.ac.in/courses/106101061/1`
3. `http://ceit.aut.ac.ir/~91131079/SE2/SE2%20Website/Lecture%20Slides.html`

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CSL01	Java Programming Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: C Programming and Object-Oriented Concepts.
Course Objectives: The objective of this lab is

1. To build software development skills using java programming for real-world applications.
2. To understand and apply the concepts of classes, packages, interfaces, arraylist, exception handling and file processing.
3. To develop applications using JDBC programming and event handling.

Course Outcomes:

1. Develop and implement Java programs for simple applications that make use of classes, packages and interfaces.
2. Develop and implement Java programs with arraylist, exception handling and multithreading .
3. Design applications using file processing, JDBC programming and event handling.

List of Experiments:
Excercise 1: (Basics)

1. Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root.
2. Write a java Program to check the number is Prime or not.

Excercise 2: (Operations, Expressions, Control-flow, Strings)

1. Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root.
2. Write a JAVA program to sort for an element in a given list of elements using bubble sort.
3. Write a JAVA program that checks whether a given string is a palindrome or not. Ex: MADAM is a palindrome.

Excercise 3: (Class, Objects, Constructor)

1. Write a program to create a class Student with data ‘name, city and age’ along with method printData to display the data. Create the two objects s1 ,s2 to declare and access the values.

2. Write a program in JAVA to demonstrate the method and constructor overloading.
3. Write a program in JAVA to create a class Bird also declares the different parameterized constructor to display the name of Birds.

Excercise 4: (Inheritance, Method Overriding)

1. Write a JAVA program to implement Single Inheritance
2. Write a JAVA program to implement multi level Inheritance
3. Write a java program for abstract class to find areas of different shapes
4. Write a JAVA program that implements Runtime polymorphism(Method Overriding) problem

Excercise 5: (Array List & Exception)

1. Write a program to perform string operations using ArrayList. Write functions for the following
   a. Append
   b. Insert
   c. Search
   d. List all string starts with given letter.
2. Write a JAVA program that describes exception handling mechanism
3. Write a JAVA program Illustrating Multiple catch clauses

Excercise 6: (User defined Exception)

1. Write a JAVA program for creation of Illustrating throw.gram that implement Queue (its operations) using arrays.
2. Write a JAVA program for creation of Illustrating finally.
3. Write a JAVA program for creation of Java Built-in Exceptions.
4. Write a JAVA program for creation of User Defined Exception.

Excercise 7: (Threads)

1. Write a JAVA program that creates threads by extending Thread class .First thread display “Good Morning “every 1 sec, the second thread displays “Hello “every 2 seconds and the third display “Welcome” every 3 seconds ,(Repeat the same by implementing Runnable).
2. Write a java program for to solve producer consumer problem in which a producer produce a value and consumer consume the value before producer generate the next value.

Excercise 8: (File Handling)

1. Write a java program that displays the number of characters, lines and words in a text file.

Excercise 9: (JDBC & Packages)

1. Write a java program that connects to a database using JDBC of the following
   a. add
   b. Delete
   c. Modify
   d. Retrieve operations.
2. Write a java program to create a package called employee and implement this package out of the package.

Excercise 10: (Applet)

1. Write a JAVA program to paint like paint brush in applet.
2. Write a JAVA program to display analog clock using Applet.
3. Develop an Applet that receives an integer in one text field & compute its factorial value & returns it in another text filed when the button "Compute" is clicked.

Excercise 11: (Event Handling)

1. Write a JAVA program that display the x and y position of the cursor movement using Mouse.
2. Write a JAVA program that identifies key-up key-down event user entering text in a Applet.

Excercise 12: (Swings)

1. Write a JAVA program to build a Calculator in Swings.
2. Write a JAVA program to display the digital watch in swing tutorial.

Excercise 13: (Swings - Continued)

1. Write a JAVA program that to create a single ball bouncing inside a JPanel.
2. Write a JAVA program JTree as displaying a real tree upside down

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CSL02	Front End Web Technologies Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Objectives: This course provide students with theoretical and practical skills in the design and development of web pages using HTML5,CSS, JS and jQery.
Course Outcomes: After Completion of this course, students would be able to:

1. Develop static html pages.
2. Develop Interactive Web Pages with different styles and client side validations.
3. Make use of JQuery programming to develop Web pages.
4. Apply JQuery UI to HTML pages.

List of Experiments:
Excercise 1: Create the following web

1. Welcome.html

   It explain about website

   (Hint: Heading the website (Preferable H1, Describe website) it includes minimum two paragraphs)
2. Aboutus.html (Hint: About owner of website)
3. Contactus.html
4. List.html (Hint: Mention List of courses)

Excercise 2:

1. Create web pages for each course. Example cse.html (Hint: It contains Heading and List of subjects in tabular form) Example

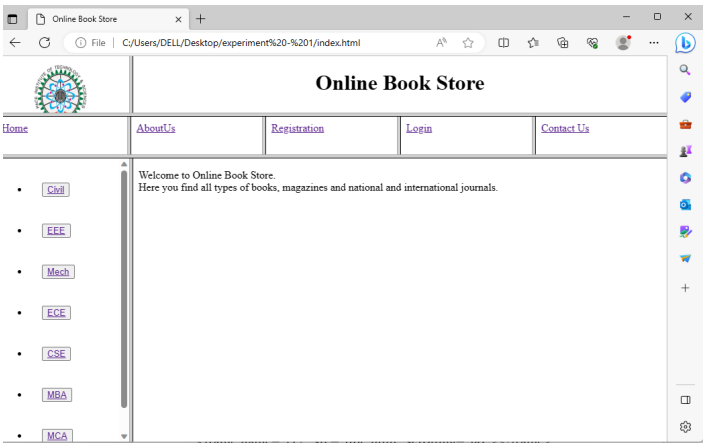
SNo	Title Book	Author	Publisher	Price	Image
–	–	–	–	–	–

2. Create Registration and Login forms

   Registration Form: It contains Student Name, Roll Number, Password, Gender, Email ID, PhoneNumber, opted course and languages known.

   Login Form: It contains roll number as User ID, password, submit button and cancel button.

Excercise 3: Apply CSS 3 on web-pages created on Excercise-1 and Excercise-2. Make use of the selectors like class, id, html elements, pseudo classes and elements



Excercise 4:

1. Apply validation on Registration and Login forms.
2. In contactus.html web-page add Google maps.

Excercise 5:

1. Design HTML5 web page by embedding Audio, Video elements.
2. b. Write HTML5 and JavaScript code to draw Arc, Circle, Rectangle and Triangle using Canvas.

Excercise 6: Bootstrap Concepts on Grid System, Menus
Excercise 7: Create index.html page and design it as shown in above screen (Hint: Use Bootstrap Grid System, Horizontal and vertical menus, footer, table etc.)
Excercise 8: Write a jQuery code to make draggable Rectangle
Excercise 9: Write jQuery code to demonstrate the usage of important options disabled, delay, distance and clone in the drag function of jQuery UI.
Excercise 10: Write jQuery code to demonstrate three options addClass, disable and tolerance in the drop function of jQuery UI.
Excercise 11: Write jQuery code to demonstrates the use of two options delay and distance of selectable()method.
Excercise 12: Write jQuery code to demonstrate Accordion and Date Picker.
Web References:

1. https://www.w3schools.com/
2. https://jqueryui.com/
3. https://api.jquery.com/
4. https://www.educba.com/software-development/software-development-tutorials/html-tutorial/

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CSL03	Free Open Source Software	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: NIL
Course Objectives: To teach students various unix utilities and shell scripting
Course Outcomes:

1. Implement various applications using build systems.
2. Understand the installation of various packages in open source operating systems
3. Create simple applications using shell.
4. Understand various version control systems.
5. Understand the kernel configuration and virtual environment

1. **Session-1**
   (a) Log into the system
   (b) Use vi editor to create a file called myfile.txt which contains some text.
   (c) Correct typing errors during creation.
   (d) Save the file
   (e) logout of the system

   Session-2
   (a) Log into the system
   (b) open the file created in session 1
   (c) Add some text
   (d) Change some text
   (e) Delete some text
   (f) Save the Changes
   (g) Logout of the system
2. (a) Log into the system
   (b) Use the cat command to create a file containing the following data. Call it mytable use tabs to separate the fields
   1425 Ravi 15.65
   4320 Ramu 26.27
   6830 Sita 36.15
   1450 Raju 21.86

(c) Use the cat command to display the file, mytable.

(d) Use the vi command to correct any errors in the file, mytable.

(e) Use the sort command to sort the file mytable according to the first field. Call the sorted file my table (same name)

(f) Print the file mytable

(g) Use the cut and paste commands to swap fields 2 and 3 of mytable. Call it my table (same name)

(h) Print the new file, mytable

(i) Logout of the system

(j) Login to the system

(k) Use the appropriate command to determine your login shell

(l) Use the /etc/passwd file to verify the result of step b.

(m) Use the who command and redirect the result to a file called myfile1. Use the more command to see the contents of myfile1.

(n) Use the date and who commands in sequence (in one line) such that the output of date will display on the screen and the output of who will be redirected to a file called myfile2. Use the more command to check the contents of myfile2.

3. Write a sed command that deletes the first character in each line in a file.

(a) Write a sed command that deletes the character before the last character in each line in a file.

(b) Write a sed command that swaps the first and second words in each line in a file.

4. Pipe your /etc/passwd file to awk, and print out the home directory of each user.

(a) Develop an interactive grep script that asks for a word and a file name and then tells how many lines contain that word.

(b) Repeat

(c) Part using awk

5. (a) Write a shell script that takes a command –line argument and reports on whether it is directory, a file, or something else.

(b) Write a shell script that accepts one or more file name as arguments and converts all of them to uppercase, provided they exist in the current directory.

6. Write a shell script that accepts a file name starting and ending line numbers as arguments and displays all the lines between the given line numbers.

7. (a) Write a shell script that computes the gross salary of a employee according to the following rules

i. If basic salary is ¡ 1500 then HRA =10% of the basic and DA =90% of the basic.
ii. If basic salary is ¿=1500 then HRA =Rs500 and DA=98salary is entered interactively through the key board.

8. Write a shell script to search given number using binary search.
9. (a) Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
   (b) Develop an interactive script that ask for a word and a file name and then tells how many times that word occurred in the file.
   (c) Write a shell script to perform the following string operations:
      i. To extract a sub-string from a given string.
      ii. To find the length of a given string.
10. Write a shell script which will display Armstrong numbers from given arguments
11. Write a shell script to display factorial value from given argument list
12. Write a C program that simulates ls Command (Use system calls / directory API)

Do the following Shell programs also

1. Write a shell script to check whether a particular user has logged in or not. If he has logged in, also check whether he has eligibility to receive a message or not
2. Write a shell script which will display the username and terminal name who login recently in to the unix system
3. Write a shell script to find no. of files in a directory
4. Write a shell script to check whether a given number is perfect or not
5. Write a menu driven shell script to copy, edit, rename and delete a file
6. Write a shell script for concatenation of two strings
7. Write a shell script which will display Fibonacci series up to a given number of argument
8. Write a shell script to accept student number, name, marks in 5 subjects. Find total, average and grade. Display the result of student and store in a file called stu.data

   Rules: avg¿=80 then grade A

   Avg¡80&&Avg¿=70 then grade B

   Avg¡70&&Avg¿=60 then grade C

Avg¡60&&Avg¿=50 then grade D

Avg¡50&&Avg¿=40 then grade E

Else grade F

9. Write a shell script to accept empno,empname,basic. Find DA,HRA,TA,PF using following rules. Display empno, empname, basic, DA,HRA,PF,TA,GROSS SAL and NETSAL. Also store all details in a file called emp.data

   Rules: HRA is 18% of basic if basic ¿ 5000 otherwise 550 DA is 35% of basic

   PF is 13% of basic

   IT is 14% of basic

   TA is 10% of basic

10. Write a shell script to demonstrate break and continue statements
11. Write a shell script to display string palindrome from given arguments
12. Write a shell script to display reverse numbers from given argument list
13. 13. Write a shell script which will find maximum file size in the given argument list
14. Write a shell script which will greet you “Good Morning”, ”Good Afternoon”, “Good Evening” and “Good Night” according to current time
15. Write a shell script to sort the elements in a array using bubble sort technique
16. Write a shell script to find largest element in a array
17. Write an awk program to print sum, avg of students marks list
18. Write an awk program to display students pass/fail report
19. Write an awk program to count the no. of vowels in a given file
20. Write an awk program which will find maximum word and its length in the given input File
21. Write a shell script to generate the mathematical tables.
22. Write a shell script to sort elements of given array by using selection sort.
23. Write a shell script to find number of vowels, consonants, numbers, white spaces and special characters in a given string.
24. Write a shell script to search given number using binary search.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CSS01	Source Code Management Usimg GIT & GIT HUB	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: NILL

Course Objectives: This laboratory course gives a thorough understanding of the concepts of Source Code Management/git internals +branching merging strategy (use cases).

Course Outcomes: On completion of this course, the students will be able to

1. Learn the history and overview of source code management.
2. Got knowledge on how to use Git commands
3. How versioning will perform in Git & GitHub
4. Understand the traditional toolkit for DevOps.
5. Learn the Control systems of DevOps.

Experiments:

1. Introducing version control
2. Installing git CLI and git GUI
3. Initializing the repository and exploring git –help
4. Exploring GitHub and creating a public repository.
5. Working with git basic commands-Git init,status,clone.
6. Working with git commands-Git add, commit, stage.
7. Git configuration files
8. Git attributes and Gi ignore
9. Staging files
10. Working with git history
11. Log, graphical history, undo changes in history
12. Merge resolution in git
13. Git branch, basic conflict, and merge resolution workflow

Learning Resources

Reference Book

i) Pro Git – Book by Scott Chacon and Ben Straub, 2nd Edition, 2014 (available at https://git-scm.com/book/).

Course Code	Course Name	Course Structure			
P21MCT03	Environmental Science	L	T	P	C
		3	0	0	3

Internal Marks: 100

Course Prerequisite: Basic knowledge about sciences up to intermediate or equivalent level.

Course Objectives: The student will be able to

1. Overall understanding of the natural resources
2. Basic understanding of the ecosystem and its diversity
3. Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities
4. An understanding of the environmental impact of developmental activities
5. Awareness on the social issues, environmental legislation and global treaties

Course Outcomes: After going through this course the student will be able to acquire

1. TThe need for protecting , the students will be able to acquire.
2. The natural resources and their importance for the sustenance of the life.
3. Various attributes of the pollution and their impacts.
4. The biodiversity of India and conservation practices to protect the biodiversity
5. Social issues both rural and urban environment and the possible means to combat the challenges.

UNIT–I: (9 Lectures)

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: Definition, Scope and Importance– Need for Public Awareness. Renewable energy Resources, Solar energy-solar cells, solar batteries, wind energy, wind mills, ocean energy, tidal energy and nonrenewable energy resources: LPG, water gas, producer gas. World food problems, degradation and Soil erosion - overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging and salinity.

UNIT–II: (8 Lectures)

ECOSYSTEMS: Concept of an ecosystem. – Structure, Components and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Ecological pyramids - Food chains, food webs and Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem. b. Grassland ecosystem c. Desert ecosystem d. Aquatic – River and Lake Ecosystems.

UNIT–III: (8 Lectures)

BIODIVERSITY AND ITS CONSERVATION: Introduction, Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India –Value of biodiversity: consumptive use, Productive use, social, ethical and aesthetic values –

Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT–IV: (9 Lectures)

ENVIRONMENTAL POLLUTION: Definition, Cause, Effects and Control measures of : a. Air Pollution, b. Water pollution, c. Soil pollution, d. Marine pollution, e. Noise pollution, f. Nuclear hazards.

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes

Disaster management: floods, earthquake, cyclone and landslides.

UNIT–V: (8 Lectures)

SOCIAL ISSUES AND THE ENVIRONMENT: From unsustainable to sustainable development – Urban problems related to energy – Water conservation, rain water harvesting and watershed management –Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies Population growth – Impacts on society, variation among nations. Environmental Impact Assessment (EIA) and Environmental Protection Acts.

Text Books:

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press, 2005.
2. Environmental Studies by Benny Joseph, Tata McGraw Hill Co, New Delhi, 2008.

Reference Books:

1. Environmental Science & Engineering,Anubha Kaushik, New Age International (P) Limited, 2006.
2. Perspectives in Environmental Studies, Second edition, AnubhaKoushik and C.P. Koushik, New Age International (P) Limited, Publishers, 2006.

Online References:

1. Environmental Science - Oxford Research Encyclopedia
2. Environmental Science - Museum of Science and Industry
3. Collegesat.du.ac.in/UG/Envinromental%20Studies_ebook.pdf

Course Code	Course Name	Course Structure			
P21CST05	Mathematical Foundations of Computer Science	L	T	P	C
		3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: An understanding of Mathematics in general is sufficient.
Course Objectives: This course is designed to:

1. To introduce the concepts of mathematical logic.
2. To state the definitions of binary relation, equivalence relation, equivalence class.
3. To introduce the basic counting principles of permutations, combinations.
4. To introduce generating functions and recurrence relations.
5. To use Graph Theory for solving Engineering problems.

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

1. Understand and apply the logic statements and express logical sentences in terms of logical connectives.
2. Understand sets, relations and functions.
3. Demonstrate in practical applications the use of basic counting principles of permutations, combinations, inclusion/exclusion principle.
4. Analyze the various types of recurrences relations and apply the methods to find out their solutions.
5. Solve Science and Engineering problems using Graph Theory.

UNIT–I: (12 Lectures)

Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof, Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

UNIT–II: (13 Lectures)

Set Theory: Sets: Operations on Sets, Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties.

UNIT–III: (13 Lectures)

Combinatorics: Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems. The principles of Inclusion – Exclusion. Pigeon hole principles and its application. Algebraic Structures: Algebraic Systems, Properties, Semi Groups and Monoids, Group, Subgroup and Abelian Group, Homomorphism, Isomorphism.

UNIT–IV: **(11 Lectures)**

Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations.

UNIT–V: **(11 Lectures)**

Graph Theory: Basic Concepts, Graph Theory and its Applications, Sub graphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees- BFS and DFS Algorithms, Minimum Spanning Trees- Prim's and Kruskal's Algorithms.

Text Books:

1. Discrete Mathematics and its Applications with Combinatorics and Graph Theory- Kenneth H Rosen, 7th Edition, 2013.
2. Elements of DISCRETE MATHEMATICS- A computer Oriented Approach- C L Liu, D P Mohapatra. Third Edition, Tata McGraw Hill.2008.
3. Discrete Mathematics for Computer Scientists and Mathematicians, J.L. Mott, A. Kandel, T.P. Baker, PHI, 2010.

Reference Books:

1. Discrete Mathematical Structures with Applications to Computer Science-J.P. Tremblay and R. Manohar, TMH, 2008.
2. Discrete Mathematics- Richard Johnsonbaugh, 7^{th} Edition., Pearson Education,2008.
3. Discrete Mathematics with Graph Theory- Edgar G. Goodaire, Michael M. Parmenter.2/e, 2002.
4. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimaldi, 5^{th} edition, Pearson Education, 2004.

Web References:

1. `www.tutorialspoint.com`
2. `www.lecturenotes.in`

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CST08	Design and Analysis of Algorithms	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Mathematics, Data Structures

Course Objectives:

1. Analyze the asymptotic performance of algorithms.
2. Write rigorous correctness proofs for algorithms.
3. Demonstrate a familiarity with major algorithms and data structures.
4. Apply important algorithmic design paradigms and methods of analysis.
5. Synthesize efficient algorithms in common engineering design situations.

Course Outcomes:

1. Identify time, space complexities for different problems.
2. Implement Greedy Method to solve Problems.
3. Implement Dynamic Programming technique to solve Problems.
4. Able how to apply Backtracking and Branch & Bound Techniques in real-time problems.
5. Analyze the pattern-matching algorithms.

UNIT–I: (12 Lectures)

Introduction: What is an Algorithm, Pseudo code Conventions Recursive Algorithm, Performance Analysis, Space Complexity, Time Complexity, Asymptotic Notations .

Dived and Conquer: General Method, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort.

UNIT–II: (12 Lectures)

The Greedy Method: The General Method, Knapsack Problem, Minimum-cost Spanning Trees, Prim's Algorithm, Kruskal's Algorithms, Huffman Coding, Optimal Merge Patterns, Single Source Shortest Paths.

UNIT–III: (12 Lectures)

Dynamic Programming: The General Method, All Pairs Shortest Paths, Single – Source Shortest paths General Weights, String Edition, 0/1 Knapsack, Travelling Salesperson Problem.

UNIT–IV: (12 Lectures)

Backtracking: The General Method, the 8-Queens Problem, Sum of Subsets, Graph Coloring, Hamiltonian Cycles.

Branch and Bound: The Method, The 15-Puzzle problem, Traveling Salesperson.

UNIT–V: (12 Lectures)

NP-Hard and NP-Complete Problems: Travelling salesman problem NP complete, NP-Hard Graph Problem (Clique Decision Problem). Pattern Matching Algorithms:

Knuth-Morris-Pratt KMP String Matching Algorithm, Rabin Karp String Matching Algorithm.

Text Books:

1. Fundamentals of computer algorithms E. Horowitz, S. Sahni , University Press Sixth Edition and year 2008.
2. Introduction to Algorithms Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Third edition, 2009.

Reference Books:

1. Computer algorithms : introduction to design and analysis, Sara Baase, Pearson Education, 2009.
2. Algorithm Design, Jon Kleinberg, Eva Tardos, Pearson First edition 2006.

Web References:

1. https://nptel.ac.in/courses/106/106/106106131/
2. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
3. https://slideplayer.com/slide/5877267/

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CST06	Advanced Python Programming	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Python Programming

Course Objectives:

1. To Implement database connection using python
2. To Use appropriate python libraries for various array, machine learning and data framesrelated problems.
3. To use numpy libraries for various mathematical & numerical problems.
4. To use Python Scipy, Seaborn, Scikit-learn Libraries.
5. To develop applications of mataplot libraries in Python.

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

1. Understand database connection using python.
2. Understand machine learning and data framesrelated problems. .
3. Implement various mathematical & numerical problems by using numpy.
4. Develop and usage of Scipy, Seaborn, Scikit-learn Libraries.
5. Understand Visualization for various data sets by using matplot library.

UNIT–I: **(7 Lectures)**

DATABASE: Introduction to MySQL, Database connections, Executing queries, handling error.

UNIT–II: **(10 Lectures)**

Pandas Library: Introduction, Environment Setup

Introduction to Data Structures: Series, DataFrame, Panel, Basic Functionality, Descriptive Statistics, Function Application, Reindexing, Iteration, Sorting.Working with Text Data, Options & Customization, Indexing & Selecting Data.

Statistical Functions: Window Functions, Aggregations, Missing Data, GroupBy, Merging/Joining, Concatenation, Date Functionality Timedelta, Categorical Data, Visualization.

UNIT–III: **(11 Lectures)**

NumPy Library: Environment, Ndarray Object, Data Types, Array Attributes, Array Creation Routines, Array from Existing Data, Array From Numerical Ranges, Indexing & Slicing, Iterating Over Array, Array Manipulation, String Functions, Mathematical Functions, Arithmetic Operations, NumPy - Statistical Functions, Sort, Search & Counting Functions, NumPy - Matrix Library, NumPy - Linear Algebra, NumPy - I/O .

UNIT–IV: **(8 Lectures)**

Basic Introduction to Scipy, Seaborn, Scikit-learn Libraries

UNIT–V: **(7 Lectures)**

Basic Introduction to matplotlib, usage of different built-in-methods in matplot, and apply methods different datasets.

Text Books:

1. Murach's Python Programming (2nd Edition) Joel Murach, Michael Urban, 2021.
2. Python Training guide (BPB Publications), 2017.

Reference Books:

1. Mark Lutz, Programming Python, O'Reilly, 5^{th} Edition, 2013.

Web References:

1. https://www.codecademy.com/learn/learn-python
2. http://www.diveintopython3.net/
3. https://www.python.org/3/
4. https://www.learnpython.org
5. https://www.javatpoint.com/python-tutorial

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CST07	Database Management Systems	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: NIL

Course Objectives:

1. Provides students with theoretical knowledge
2. Practical skills in the design, use of databases and database management systems in information technology applications.

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

1. Acquire knowledge in fundamentals of DBMS and identify the differences between traditional file system and DB systems.
2. Understand various DBMS models and how queries are being processed and executed in RDBMS.
3. Analyze DB design methodology and normalization process.
4. Discuss the various transaction and concurrency management techniques
5. Discuss various files indexing techniques.

UNIT–I: (12 Lectures)

INTRODUCTION: Database system, Purpose of Database, view of data, Characteristics (Database Vs File System), Database Users (Actors on Scene, Workers behind the scene) and DBA, Advantages of Database Systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance, and data independence; Three-tier schema architecture for data independence; Database system structure

UNIT–II: (13 Lectures)

ENTITY RELATIONSHIP MODEL: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, subclasses, super class, inheritance, specialization, generalization using ER Diagrams.

RELATIONAL MODEL: Introduction to the relational model, concepts of domain, attribute, tuple, relation, the importance of null values, constraints, and their importance.

BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, views.

UNIT–III: (11 Lectures)

SCHEMA REFINEMENT (NORMALIZATION): Introduction to schema Refinement, functional dependencies, Normal forms : 1NF,2NF,3NF,BCNF, properties decompositions, normalization, schema refinement in database design, case studies.

UNIT–IV: (13 Lectures)

TRANSACTION MANAGEMENT AND CONCURRENCY CONTROL: Transaction, properties of transactions, transaction log, and transaction management with SQL using commit rollback and save point. Concurrency control for lost updates, uncommitted data, inconsistent retrievals and the Scheduler. Concurrency control with locking methods: lock granularity, lock types, two phases locking for ensuring serializability, deadlocks, Concurrency control with time stamp ordering: Wait/Die and Wound/Wait Schemes, Database Recovery management : Transaction recovery.

UNIT–V: (11 Lectures)

OVERVIEW OF STORAGES AND INDEXING: Data on External Storage- File Organization and Indexing – Clustered Indexing – Primary and Secondary Indexes, Index Data Structures, Hash-Based Indexing – Tree-Based Indexing, index sequential access method(ISAM).

Text Books:

1. Database Management Systems, 3/e Raghuram Krishnan, Johannes Gehrke, TMH,2003.
2. Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA,2011.
3. Database Principles Fundamentals of Design Implementation and Management, Carlos Coronel, Steven Morris, Peter Robb, Cengage Learning,2012.
4. Database Management Systems,Rajesh Narang,Second Edition,2018.

Reference Books:

1. Database System Concepts Abraham Silberschatz, Henry F. Korth, S. Sudarshan, 2006.
2. An Introduction to Database Systems, 8/e C J Date, PEA,2006.
3. The Database Book Principles & Practice: Using the Oracle Database, Narain Gehani, Melliyal Annamalai, 2011.

Web References:

1. `www.academy.vertabelo.com`
2. `www.w3schools.com`
3. `www.codecademy.com`

Course Code	Course Name	Course Structure			
		L	T	P	C
P21SST01	Developing Soft Skills and Personality	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: The students should have basic knowledge of soft skills.

Course Objectives:

1. To encourage the all round development of students by focusing on soft skills.
2. To make the engineering students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.
3. To develop and nuture the soft skills of the students through individual and group activities.
4. To expose students to right attitudinal and behavioral aspects and to build the same through activities.

Course Outcomes:

1. To enhance soft skills and significance of soft skills in working environment.
2. To develop interpersonal l skills.
3. To become more effective individual through goal/target setting and self motivation.
4. To develop techniques to manage time.
5. To become self confident individual by mastering interpersonal skills, team management skills and leadership skills.

UNIT–I: (9 Lectures)

SOFT SKILLS

Introduction- What are soft skills?-Importance of soft skills-Selling your soft skills-Attributes regarded as soft skills-Soft skills-social-soft skills-Thinking soft skills-Negotiating- Exhibiting your soft skills-identifying your soft skills-improving your soft skills-will formal training enhance your soft skills- soft skills training- train yourself-Top 60 soft skills- practicing soft skills- measuring attitude

UNIT–II: (9 Lectures)

INTERPERSONAL SKILLS

Significance of interpersonal skills-factors that prevent building and maintaining positive relationships-advantages of positive relationships-disadvantages of negative relationships.

UNIT–III: (9 Lectures)

GOAL SETTING

Introduction-Goal -significance of goal setting-goal setting process-qualities of effective goals-barriers to reach goals

UNIT–IV: (9 Lectures)

TIME MANAGEMENT

Introduction-What are time wasters?-ABC technique-The Pickle Jar Theory of time management-First thing first-Tips to manage time effectively.

UNIT–V: (9 Lectures)

TEAM BUILDING AND TEAM WORK

Introduction-Meaning-Aspects of team building-skills needed for team work- A model of team building-Team Vs Group- Characteristics of effective team- Role of a team leader- Role of team members-nine persons a successful team should have-inter-group collaboration- Factors shaping inter-group collaboration.

Reference Books:

1. Soft Skills for Success: G.R.K Murthy, 2005.
2. Soft Skills:Dr. K. Alex, 2009.
3. Soft Skills: Dr. B.V. Pattabhi Ram Life Skills: M.L.Suresh Kumar Austin, Ten Keys to Time Management, 2010.

Web References:

1. http://www.coachville.com/tl/thomasleonard/karla/formsCD/161keystotimemanagement.
2. œTimeMangamenthttp://www.timethoughts.com/time-
3. management.htm.Studocu.com/in/docur
4. https://daringtolivefully.comself-awareness
5. œImportanceofTeamandTeamwork.http://www.managementstudyguide.com/importance-of-team.htm.
6. Pandita,R.PrinciplesofEffectiveTeamwork.2011.http://www.buzzle.com/articles/principles-of-efffective-teamwork.html.
7. TeamworkPrinciples.http://www.the-happy-manager.com/teamwork-principles.html.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CSL06	R Programming Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: NILL

Course Objectives: This course provides a solid undergraduate foundation in both probability theory and mathematical statistics and at the same time provides an indication of the relevance and importance of the theory in solving practical problems in the real world.

Course Outcomes:

1. Understand the fundamental syntax of R through readings, practice exercises, demonstrations, and writing R code.
2. Apply critical programming language concepts such as data types, iteration, control structures, functions, and boolean operators by writing R programs and through examples
3. Apply the Import a variety of data formats into R using RStudio
4. Able to Prepare or tidy data's for in preparation for analysis
5. Analyze a data set in R and present findings using the appropriate R packages

List of Experiments:

1. History of R.
2. Installing R and Packages in R.
3. Write a program to illustrate Data types in R.
4. Write a program to illustrate creating and manipulating a Vector in R.
5. Write a program to illustrate creates a matrix and manipulating matrix in R.
6. Write a program to illustrate performing Arithmetic of matrices.
7. Write a program to Creating and operations on Factors in R.
8. Write a program to illustrate various Data frame Operations.
9. Write a program to illustrate List & it's Operations in R.
10. Write a program to illustrate if-else-else-if in R.
11. Write a program to illustrate While and For loops in R.
12. Write a program to illustrate Compare and Matrices and Compare Vectors.
13. Write a program to illustrate to create Graphs and usage of plot( ) function in R.

14. Write a program to illustrate Customizing and Saving to graphs in R.

Text Book

1. The Book of R-A first course in programming and statistics by Tilman M.Davies, 2016.
2. R Programming-Robin Evans,version: November 5, 2014.
3. R for Beginners by Emmanuel Paradis, 2005.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CSL04	Advanced Python Programming Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Outcomes:

1. Understand database connection using python.
2. Understand machine learning and data framesrelated problems. .
3. Implement various mathematical & numerical problems by using numpy.
4. Develop and usage of Scipy, Seaborn, Scikit-learn Libraries.
5. Understand Visualization for various data sets by using matplot library.

List of Experiments:

Exercise1: WAP how to connect MySQL data base in python.

Exercise2: WAP to implement various queries after connecting data base.

Exercise3: Implement various methods of numpy Library.

Exercise4: Implement various methods of Pandas Library.

Exercise5: Implement various methods of Scipy Library.

Exercise6: Implement various methods of Seaborn Library.

Exercise7: Implement various methods of Scikit-learn Library.

Exercise8: Implement various methods of matplotlib for Visualization.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CSL05	Database Management Systems Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: NILL

Course Objectives:

1. Understand, analyze and apply SQL commands like DDL,DML,DCL to perform different Database operations
2. Understand and practice PL/SQL block, control statements and cursors.
3. Develop PL/SQL programs using, functions, procedures, packages and Triggers.

Course Outcomes:

1. Know about SQL DDL,DML,DCL,TCL commands
2. Know how to write SQL Quires using set operators
3. Know about how to implement PL/SQL programs using conditional ,loops statements
4. Know about implementing of triggers, cursors and exceptions
5. Know about implementing procedures, functions and packages

PROGRAMS LIST

1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables).
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions, string functions and date functions
5. (a) Creation of simple PL/SQL program which includes declaration section, executable section and exception –Handling section
   (b) Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISEAPPLICATION ERROR.

8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.

PL/SQL

9. Usage of triggers to perform the operation on single and multiple Table.
10. Write a PL/SQL block illustrating packages.
11. Write a PL/SQL code using CURSOR.
12. PL/SQL procedures for data validation.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CSS02	Data Science Using Python	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: NILL

Course Objectives:

1. Understand the process of Importing and Exporting thedata.
2. Learn how to collect, store and manage data from multiple data sources.
3. Know the insights of data using statistical methods
4. Identify different techniques for data analysis and data visualization.
5. Discuss the applications of Data Science for real world problems.

Course Outcomes: After completion of the course, students would be able to:

1. On completion of the course the student should be able to
2. Examine the process for importing and exporting the data.
3. Apply appropriate data collection and pre-processing methods.
4. Identify different data analysis Techniques suitable for a given applications
5. Demonstrate data visualization techniques for Data Analysis.

The following exercises are to be done.

Week 1

1. (a) Write program to create a list, manipulate and slices it.
   (b) Create a new list and add elements to it from another list, and creates a matrix from two lists
   (c) Create same a, b steps for Tuple and Dictionary

Week 2

2. Write a program for Accessing/Importing and Exporting Data

Week 3

3. The following table gives the size of the floor area (ha) and the price ($A000),for 15 houses sold in the Canberra (Australia) suburb of Aranda in 1999.

Week 4

4. Consider the sample data

   Mean velocity: 0.2474, 0.1235, 0.1737, 0.1824

   Standard deviation of velocity: 0.3314, 0.2278, 0.2836, 0.2645

   Write a Python program to create bar plots with error bars on the same figure. Attach a text label above each bar displaying means.

Week 5

5. Apply basic statistical methods on Sample Datasets

Week 6

6. Develop an application to analyze Stock Market Data using Python tools.

Week 7

7. Given the iris dataset: https://archive.ics.uci.edu/ml/datasets/iris
   (a) How many rows does it contain? How many columns?
   (b) Compute the average petal length
   (c) Compute the average of all numerical columns
   (d) Extract the petal length outliers (i.e. those rows whose petal length is 50% longer

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CST09	Computer Networks	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Fundamentals of Computer.

Course Objectives:

1. To introduce the fundamental concepts of computer networking.
2. To familiarize with networking concepts to work on various Protocols of ISO-OSI and TCP/IP.

Course Outcomes:

1. Compare protocol models (OSI, TCP/IP) and select suitable protocol for network design.
2. Design a network by deciding relevant multiplexing and switching technique to improve performance of the network.
3. Apply flow control, error control techniques and protocols to verify the correctness of data in the communicated network.
4. Apply routing and congestion control algorithms to deliver data packets across the networks.
5. Use communication protocols like IP, TCP, UDP, DNS, HTTP, FTP across the Internet

UNIT–I: (8 Lectures)

Introduction: Introduction - components of data communication, data flow, network topologies, categories of networks-LAN, MAN, WAN, ISO-OSI model, TCP/IP.

UNIT–II: (8 Lectures)

Physical Layer: Multiplexing- frequency division multiplexing, synchronous time division multiplexing, statistical time division multiplexing, Introduction to switching - circuit switched networks, datagram networks, virtual circuit networks

UNIT–III: (11 Lectures)

Data Link Layer: Design issues, framing, error control, error detection and correction, CRC, checksum, hamming code. Elementary data link layer protocols-simplex protocol, simplex stop and wait, simplex protocol for noisy channel.

Sliding window protocol: one bit, Go back N, selective repeat, data link layer in HDLC, PPP. Medium Access Control Sub Layer ALOHA, CSMA, CSMA/CD, IEEE standards- standard Ethernet, wireless LAN, bridges..

UNIT–IV: (9 Lectures)

Network Layer: Routing algorithms- shortest path routing, distance vector, link state routing, and hierarchical routing. Congestion control algorithms-congestion control in virtual circuit subnets, datagram subnet, leaky bucket, token bucket. The network layer in the Internet: The IP protocol, IPAddresses-IPv4, IPv6.

UNIT–V: **(12 Lectures)**

Transport Layer: Transmission Control Protocol (TCP)- services, segment header, connection establishment, termination, transmission policy, congestion control. User Datagram Protocol (UDP)- header format.

Application Layer: The Domain Name System (DNS), electronic mailarchitecture, SMTP, FTP, HTTP.

Text Books:

1. Andrew S Tanenbaum, "Computer Networks", 4 th edition, Pearson. 2011.
2. "Data Communications and Networking",Behrouz A. Forouzan, Catherine Ann Coombs, Sophia Chung Fegan, 2002.

References:

1. S. Keshav, "An Engineering Approach to Computer Networks", 2 nd edition, Pearson Education, 1997.
2. W.A. Shay, Thomson, "Understanding Communications and Networks", 2004.

Web References:

1. http://www.cs.ccsu.edu/~stan/classes/CS490/Slides/Networks4-Ch4-4.pdf
2. http://ecourses.vtu.ac.in/nptel/courses/Webcourse-contents/IIT-MADRAS/ComputerNetworks/pdf/

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CST10	Operating Systems	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Computer System fundamentals

Course Objectives:

1. Analyze the tradeoffs inherent in operating system design.
2. Summarize the various approaches to solving the problem of mutual exclusion in an operating system.
3. Understand the principles of Deadlocks.
4. Evaluate the trade-offs in terms of memory size (main memory, cache memory, auxiliary memory) and processor speed.
5. Demonstrate disk storage strategies, file strategies

Course Outcomes:

1. Describe the role, functions and structures of operating systems and demonstrate the concept of process.
2. Analyze the performance of CPU scheduling algorithms and develop software/hardware-based solutions for critical section problems
3. Design deadlock, prevention and avoidance algorithms.
4. compare different memory management schemes and apply page replacement algorithms in virtual memory.
5. Outline the concept of files, directory structures and and analyze the performance of different disk scheduling algorithms

UNIT–I: (9 Lectures)

Computer System and Operating System Overview: Overview of Computer System hardware, Operating System Objectives and functions, Evaluation of operating System, Operating System Services, System Calls.

Process Management: Process Description, Process Control, Process States, Cooperating Processes , Inter-process Communication.

UNIT–II: (13 Lectures)

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Threads Overview, Threading issues.

Synchronization: Background, The Critical-Section Problem, Peterson solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors.

UNIT–III: (11 Lectures)

Dead Locks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

UNIT–IV: **(13 Lectures)**

Memory Management Strategies: Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of Page Table.

Virtual Memory Management: Background, Demand Paging, Page Replacement, allocation of frames, Thrashing.

UNIT–V: **(12 Lectures)**

File system Interface: The concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.

File System implementation: File system structure, allocation methods, free space management Mass storage structure, overview of Mass-storage structure, Disk scheduling.

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc, 2014.
2. William Stallings, 7th Edition, “ Operating Systems – Internals and Design Principles”, Prentice Hall, 2009.

References:

1. Andrew S. Tanenbaum “Modern Operating Systems”, Second Edition, Addison Wesley, 2014.
2. Operating Systems: A Design-Oriented Approach, Charles Crowley Crowley, Tata Mc Graw Hill Education”, 1996.
3. Operating Systems: A Concept-Based Approach, D M Dhamdhere, Second Edition, Tata Mc Graw-Hill Education, 2012.

Web References:

1. https://nptel.ac.in/courses/106/106/106106144/
2. https://www.tutorialspoint.com/operating_system
3. https://www.youtube.com/playlist?list=PLEJxKK7AcSEGPOCFtQTJhOElU44J_JAun
4. https://www.pdf-archive.com/2016/12/25/operating-system-concepts-9thedition/operating-system-concepts-9th-edition.pdf.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21AMT01	Machine Learning	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

1. Identify problems that are amenable to solution by ANN methods, and which ML methods may be suited to solving a given problem.
2. Formalize a given problem in the language/framework of different ANN methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).

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

1. Explain the fundamental usage of the concept Machine Learning system
2. Demonstrate on various regression Technique
3. Analyze the Ensemble Learning Methods
4. Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning.
5. Discuss the Neural Network Models and Fundamentals concepts of Deep Learning

UNIT–I: (9 Lectures)

Introduction- Artificial Intelligence, Machine Learning, Deep learning, Types of Machine Learning Systems, Main Challenges of Machine Learning.

Statistical Learning: Introduction, Supervised and Unsupervised Learning, Training and Test Loss, Tradeoffs in Statistical Learning, Estimating Risk Statistics, Sampling distribution of an estimator, Empirical Risk Minimization.

UNIT–II: (10 Lectures)

Supervised Learning(Regression/Classification):Basic Methods: Distance based Methods, Nearest Neighbours, Decision Trees, Naive Bayes,

Linear Models: Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, Binary Classification: Multiclass/Structured outputs, MNIST, Ranking.

UNIT–III: (11 Lectures)

Ensemble Learning and Random Forests: Introduction, Voting Classifiers, Bagging and Pasting, Random Forests, Boosting, Stacking. Support Vector Machine: Linear SVM Classification, Nonlinear SVM Classification SVM Regression, Naïve Bayes Classifiers.

UNIT–IV: (8 Lectures)

Unsupervised Learning Techniques: Clustering, K-Means, Limits of K-Means, Using Clustering for Image Segmentation, Using Clustering for Preprocessing, Using Clustering for Semi-Supervised Learning, DBSCAN, Gaussian Mixtures.

Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction, PCA, Using Scikit-Learn, Randomized PCA, Kernel PCA.

UNIT–V: **(12 Lectures)**

Neural Networks and Deep Learning: Introduction to Artificial Neural Networks with Keras, Implementing MLPs with Keras, Installing TensorFlow 2, Loading and Preprocessing Data with TensorFlow.

Text Books:

1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition, O'Reilly Publications, 2019
2. Data Science and Machine Learning Mathematical and Statistical Methods,Dirk P. Kroese, Zdravko I. Botev, Thomas Taimre, Radislav Vaisman,2020

Reference Books

1. Machine Learning Probabilistic Approach, Kevin P. Murphy, MIT Press, 2012.

Web References:

1. https://www.geeksforgeeks.org/machine-learning/
2. https://nptel.ac.in/courses/106106139

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CSE01	Software Testing Methodologies	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Pre-Requisites: Software Engineering

Course Objectives:

1. To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
2. To discuss various software testing issues and solutions in software unit test; integration, regression, and system testing.

Course Outcomes:

1. Outline the software testing terminology.
2. Compare and contrast various behavioural testing methodologies.
3. Summarize various dynamic testing techniques.
4. Summarize the importance of validation activities.
5. Interpret software testing and quality management.

UNIT–I: (8 Lectures)

Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, Definition, Model for testing, Effective Vs Exhaustive Software Testing, Software Failure Case Studies.

Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle..

UNIT–II: (10 Lectures)

Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, How to verify and validate code.

Dynamic Testing I: Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing

UNIT–III: (9 Lectures)

Dynamic Testing II: White-Box Testing: need, Logic coverage criteria, Basis path testing, Graph matrices, Loop testing, data flow testing, mutation testing. Static Testing: inspections, Structured Walkthroughs, Technical reviews.

UNIT–IV: (8 Lectures)

Validation activities: Unit testing, Integration Testing,. Function testing, system testing, acceptance testing.

UNIT–V: (12 Lectures)

Efficient Test Suite Management: Test case design, why does a test suite grow, minimizing the test suite and its benefits, test suite prioritization, Types of test

case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite.

Software Quality Management: Software Quality metrics, SQA models. **Text**

Books:

1. Naresh Chauhan, "Software Testing, Principles and Practices", Oxford, 2010.
2. Aditya P Mathur, "Foundations of Software testing", 2nd ed, 2013 , Pearson,
3. Yogesh Singh, "Software Testing", CAMBRIDGE, 2013.

Reference Books

1. Baris Beizer, "Software testing techniques", International Thomson computer press, second edition, 2003.
2. M G Limaye, "Software Testing, Principles, techniques and Tools", TMH, 2009.
3. William E Perry, "Effective Methods for Software testing", 3rd ed, 2007.

WEB LINKS

1. https://freevideolectures.comComputerScienceIITBombay
2. https://www.youtube.com/watch?v=gPE9emPFrwo
3. https://nptel.ac.in/courses/106105150
4. www.softwaretestinghelp.com
5. https://www.atlassian.com/landing/software-testing/

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CSE02	Big Data Analytics	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Pre-Requisites: Database Management Systems

Course Objectives:

1. To optimize business decisions and create competitive advantage with Big Data analytics.
2. To introduce the architectural concepts of Hadoop, HDFS and Map Reduce paradigm.
3. To introduce programming tools Pig , Hive in Hadoop ecosystem

Course Outcomes:

1. Illustrate the importance of big data and challenges of conventional systems.
2. Outline the building blocks of hadoop and basic file system operations.
3. Analyze data with Hadoop Map Reduce framework.
4. Process the data in a hadoop environment using Pig and Hive to solve real world and industrial problems.
5. Enumerate the open source frameworks used to efficiently store and process large data sets.

UNIT–I: (9 Lectures)

Introduction to Big Data: What is big data, Meet Hadoop – Data, Characteristics of Big Data , Data Storage and Analysis, Comparison with other systems: Relational Database Management Systems, Grid computing and Volunteer Computing.

UNIT–II: (9 Lectures)

Hadoop and HDFS: Introduction to Hadoop, Brief history of Hadoop, Apache Hadoop ecosystem. The design of Hadoop Distributed File System (HDFS), Architecture, Building blocks of Hadoop: Namenode, Datanode, Secondary Namenode, JobTracker, TaskTracker, Basic File System Operations

UNIT–III: (9 Lectures)

Map Reduce: Java Map Reduce, Introduction to Weather Dataset, Analyzing weather data with UNIX tools, Analyzing weather data with Map and Reduce, Word Count Program using Map Reduce, Combiner Functions, Running a Distributed Map Reduce Job, Anatomy of a Map Reduce Job Run, Shuffle and Sort.

UNIT–IV: (9 Lectures)

Pig - Hadoop Programming Made Easier: Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Uncovering Pig Latin structures, Looking at Pig data types and syntax, Evaluating

Local and Distributed Modes of Running Pig scripts, Checking Out the Pig Script Interfaces, Scripting with Pig Latin.

UNIT–V: (9 Lectures)

Hive –A data warehouse in Hadoop: What is Hive? The Hive shell, Hive Services, The Metastore, Comparison with traditional Databases, HiveQL, Data types, Operators and Functions, Tables, Managed tables and External Tables, Partitions and Buckets, Importing data, Altering Tables, Dropping Tables,. Querying Data.

Text Books:

1. Tom White, "Hadoop: The Definitive Guide", O'reilly Media, Fourth Edition, 2015.
2. Dirk deRoos, Paul C. Zikopoulos, "Hadoop for Dummies" John Wiley & Sons, Inc., 2014.

Reference Books

1. Paul Zikopoulos, Chris Eaton, "Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data", 1st edition, TMH, 2010.
2. Chuck Lam, "Hadoop in Action", 1st edition, Manning Publications, 2017.

WEB 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`

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CSE03	Business Intelligence	3	0	0	3

Internal Marks: 30 External Marks: 70

Prerequisites: Fundamentals of Computer

Course Objectives:

1. Be exposed with the basic rudiments of business intelligence system.
2. Understand the modelling aspects behind Business Intelligence.
3. Understand of the business intelligence life cycle and the techniques used in it.
4. Be exposed with different data analysis tools and techniques.

Course Outcomes:

1. Explain the fundamentals of business intelligence.
2. Link data mining with business intelligence.
3. Analyze the Ensemble Learning Methods
4. Explain the data analysis and knowledge delivery stages.
5. Apply business intelligence methods to various situations.

UNIT–I: (9 Lectures)

BUSINESS INTELLIGENCE: Effective and timely decisions – Data, information and knowledge – Role of mathematical models Business intelligence architectures: Cycle of a business intelligence analysis – Enabling factors in business intelligence projects – Development of a business intelligence system – Ethics and business intelligence.

UNIT–II: (10 Lectures)

KNOWLEDGE DELIVERY: The business intelligence user types, Standard reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization, Integrated Analytics, Considerations: Optimizing the Presentation for the Right Message.

UNIT–III: (9 Lectures)

EFFICIENCY: Efficiency measures – The CCR model: Definition of target objectives-Peer groups – Identification of good operating practices; cross efficiency analysis – virtual inputs and outputs – Other models. Pattern matching – cluster analysis, outlier analysis.

UNIT–IV: (7 Lectures)

BUSINESS INTELLIGENCE APPLICATIONS: Marketing models – Logistic and Production models – Case studies.

UNIT–V: **(9 Lectures)**

FUTURE OF BUSINESS INTELLIGENCE: Future of business intelligence – Emerging Technologies, Machine Learning, Predicting the Future, BI Search & Text Analytics – Advanced Visualization – Rich Report, Future beyond Technology

Text Books:

1. Efraim Turban, Ramesh Sharda, DursunDelen, "Decision Support and Business Intelligence Systems", 9 th Edition, Pearson 2013

Reference Books

1. Larissa T. Moss, S. Atre, "Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making", Addison Wesley, 2003.
2. Carlo Vercellis, "Business Intelligence: Data Mining and Optimization for Decision Making", Wiley Publications, 2009.
3. David Loshin Morgan, Kaufman, "Business Intelligence: The Savvy Managers Guide, Second Edition, 2012.
4. Cindi Howson, "Successful Business Intelligence: Secrets to Making BI a Killer App", McGraw- Hill, 2007.
5. Ralph Kimball , Margy Ross , Warren Thornthwaite, Joy Mundy, Bob Becker, "The Data Warehouse Lifecycle Toolkit", Wiley Publication Inc.,2007

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CSE04	Advanced Computer Architecture	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Pre-Requisites: Programming and Data structures, Discrete Maths, and a basic knowledge of Computer organization.

Course Objectives:

1. Understand the micro-architectural design of processors.
2. Learn about the various techniques to obtain performance improvement and power savings in current processors.

Course Outcomes:

1. Study the Concept of Parallel Processing and its applications.
2. Implement the Hardware for Arithmetic Operations.
3. Analyze the performance of different scalar Computers.
4. Analyze the instruction set architectures.
5. Distinguish the performance of pipelining and non pipelining environments in the processor.

UNIT–I: (9 Lectures)

Pipeline and vector processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors.

UNIT–II: (9 Lectures)

Computer Arithmetic: Addition and Subtraction, Hardware Implementation, Multiplication Algorithms and Hardware Implementation, Division Algorithms and Hardware Implementation, Floating Point Arithmetic Operations.

UNIT–III: (9 Lectures)

Parallel Computer Models: Evolution of Computer Architecture, System Attributes to Performance, Shared Memory Multiprocessors, Distributed Memory Multicomputers, Vector Supercomputers, SIMD SuperComputers.

UNIT–IV: (9 Lectures)

Processors and Memory Hierarchy: Advanced Processor Technology: Design Space of Processors, Instruction-Set Architectures, CISC scalar Processors, RISC scalar Processors, Super Scalar and Vector Processors: Super scalar Processors.

UNIT–V: (8 Lectures)

Pipelining and Superscalar Techniques: Linear Pipeline Processors: Asynchronous and Synchronous models, Clocking and Timing Control, Speedup, Efficiency and Throughput, Pipeline Schedule Optimization, Instruction Pipeline Design: Instruction Execution Phases, Mechanisms for Instruction Pipelining, Dynamic Instruction Scheduling, Branch Handling Techniques.

Text Books:

1. MorrisM.Mano,"ComputerSystem Architecture", 3rd edition, Pearson/Prentice Hall India. (UNIT-I,II,III,IV,V), 2017.
2. Advanced Computer Architecture, Kai Hwang, McGraw-Hill,India. (UNIT-IV,V), 2018.

Reference Books

1. Computer Organization and Architecture, William Stallings ,8th edition,PHI, 2015.
2. Computer Organization, Carl Hamachar, Vranesic,Zaky, 5th edition, McGrawHill, 2012.

WEB LINKS

1. https://nptel.ac.in/courses/106/103/106103206/
2. https://www.tutorialspoint.com/parallel_computer_architecture/parallel_computer_architecture_models.htm
3. https://www.scribd.com/presentation/387051239/Mano-Computer-System-Architecture-all-ppt
4. http://wh.cs.vsb.cz/mil051/images/5/54/PAP-PR-01_%C3%9Avod_do_problematiky_z%C5%99et%C4%9Bzen%C3%A9ho_zpracov%C3%A1n%C3%AD_instrukc%C3%AD.pdf

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CSL07	Computer Network and Operating System Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Outcomes:

1. Implement data link layer framing methods.
2. Experiment with error handling methods.
3. Make use of various routing algorithms for effective data transmission.
4. Illustrate various process scheduling algorithms.
5. Explain Page replacement algorithms and file allocation strategies.

Part-A:

1. Implement the data link layer farming methods such as character, character stuffing and bit stuffing.
2. Implement on a data set of characters the three CRC polynomials -CRC 12, CRC 16 and CRC CCIP.
3. Implement Dijkstra's algorithm to compute the Shortest path through a graph.
4. Implementation of distance vector routing algorithm.
5. Write a program for congestion control using Leaky bucket algorithm.
6. Implementation of RSA algorithm.

Part-B:

1. Simulate the following CPU scheduling algorithms
   (a) Round Robin
   (b) SJF
   (c) FCFS
   (d) Priority
2. Implementation of fork (), wait (), exec() and exit () System calls
3. Simulate the following.
   (a) Multiprogramming with a fixed number of tasks (MFT)
   (b) Multiprogramming with a variable number of tasks (MVT)
4. Simulate Bankers Algorithm for Dead Lock Avoidance

5. Simulate the following page replacement algorithms.
   (a) FIFO
   (b) LRU
   (c) LFU
6. Simulate the following File allocation strategies
   (a) Sequenced
   (b) Indexed
   (c) Linked

Course Code	Course Name	Course Structure			
		L	T	P	C
P21AML01	Machine Learning Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Objectives:

1. This course will enable students to learn and understand different Data sets in implementing the machine learning algorithms.

Course Outcomes:

1. Implement procedures for the machine learning algorithms
2. Design Python programs for various Learning algorithms
3. Develop Python programs for various Learning algorithms
4. Apply appropriate data sets to the Machine Learning algorithms
5. Develop Machine Learning algorithms to solve real world problem

Requirements: Develop the following program using Anaconda/ Jupyter/ Spyder and evaluate ML models.

List of Experiments:

Excercise-1: Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

Excercise-2: For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

Excercise-3: Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Excercise-4: Exercises to solve the real-world problems using the following machine learning methods: a) Linear Regression b) Logistic Regression c) Binary Classifier

Excercise-5: Develop a program for Bias, Variance, Remove duplicates, Cross Validation

Excercise-6: Write a program to implement Categorical Encoding, One-hot Encoding

Excercise-7: Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

Excercise-8: Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

Excercise-9: Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Excercise-10: Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

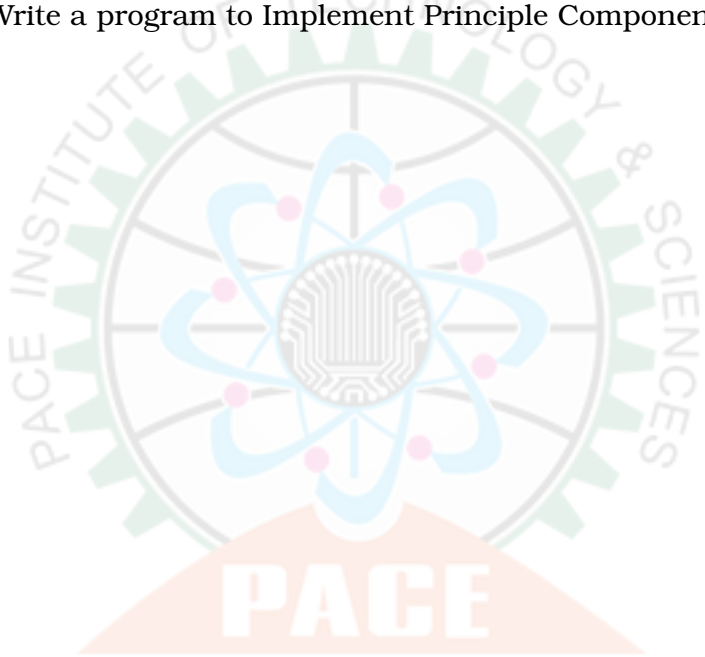
Excercise-11: Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

Excercise-12: Exploratory Data Analysis for Classification using Pandas or Matplotlib.

Excercise-13: Write a Python program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set

Excercise-14: Write a program to Implement Support Vector Machines and Principle Component Analysis

Excercise-15: Write a program to Implement Principle Component Analysis



Course Code	Course Name	Course Structure			
		L	T	P	C
P21CSS03	Android Application Development	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Outcomes:

1. Demonstrate various components of Android Framework.
2. Develop user Interfaces for the Android Application.
3. Develop Android Applications using Android API and Services.
4. Develop Android Applications which access data from Internet.

Experiments:

1. Create Hello World Android App using Android Studio and explain each step in detail.
2. Create an Activity that receive name form the user and displays Hello Name to the user using Android Studio.
3. Create an Activity that demonstrates the Life Cycle of an Activity.
4. Create an Android Application which receives URL form the user and open appropriate page in the system browser with the help of Implicit Intents using Android Studio.
5. Create an Android App which receives name form the user and displays welcome name in Second Activity.
6. Create Login Screen Application which shows Home screen if Login success otherwise displays error message using Android Studio.
7. Write an Android application program that demonstrate the use of a. RelativeLayout.

   b. LinearLayout.

   c. GridLayout.

   d. TableLayout.
8. Write an Android application program that demonstrates the use of ImageView.
9. Write an Android application program that demonstrates the use of ListView and ArrayAdapter.
10. Write an Android application program that demonstrates how to create Custom ListView and Custom Adapters.
11. Write an Android application program that demonstrates the use of SQLite Database and Cursor.

12. Write an Android application program that demonstrates Notifications.
13. Write an Android application program that demonstrates Shared Preferences.
14. Write an Android application program that connect to the internet, gets JSON data and displays the result in UI by parsing JSON data.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21XXXXX	Design Thinking for Innovation	2	0	0	0

Internal Marks: 30 External Marks: 70

UNIT–I: Design thinking Evolution

Definitions and stories. Design thinking Importance, and Impact-History and Evolution of Design Thinking, - Three Space of Innovation in Design Thinking- knowledge funnel - Design Thinking Process, -Design thinking mindset for innovation

UNIT–II: Building confidence, Mindset and Building Team

Myths of Innovation- Myths of Creativity-Creative Confidence-Innovators DNA - 5 forces of growth (SEPIA),- 5 frictional forces (DCAFE),- 3 capacity levers (VAL)-Building Design Teams.

UNIT–III: Empathy-Define

Initial Problem Description - beginner's mindset-5whys,- persona development-Empathy mapping-interview with empathy and stories collection-Question the critical assumptions -Reframe Problem Definition – (PoV) point of view- how might we

UNIT–IV: Ideation

Ideation and Visualization- Brainstorming-SCAMPER-Mind mapping-sketch –structure idea-Storyboard-Customer Co-Creation-Provocation-Role-play

UNIT–V: Prototyping -Testing

Step-by-step prototyping & low fidelity prototyping -Testing Prototyping -feedback capturing grid, conduct A/B Testing-Experiment grid, user retrospective board-Create a Pitch of the prototype

Text Books:

1. An AVA Book, "Design Thinking", AVA Publishing, 2010
2. Dr.BalaRamaduri, "Karmic Design Thinking", 2020, ISBN:978-9354190100

Reference Books:

1. proach", 3rd edition, Springer, 2007
2. Tom Kelley, Jonathan Littman, "Ten Faces in Innovation", Currency Books, 2006
3. Liedtka, Jeanne and Ogilvie, Timothy, Ten Tools for Design Thinking
4. The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses, and Ecosystems by Michael Lewrick
5. The Myths of Innovation by Scott Berkun, Publisher(s): O'Reilly Media, Inc ISBN: 9781449389628

6. The Myths of Creativity: The Truth About How Innovative Companies and People Generate Great Ideas, D BurkusJossey-Bass, San Francisco, CA (2014), 214 pp, ISBN: 978-1-118-61114-2
7. Creative Confidence: Unleashing the Creative Potential within Us All by (Author), David Kelley(Author)
8. The innovator's DNA: mastering the five skills of disruptive innovators Author: Dyer, JeffGregersen, Hal B, 1958-Christensen, Clayton MPublished: Boston, Mass: Harvard Business Press, [2011]
9. Collective Genius: The Art and Practice of Leading Innovation, Authors: Linda A Hill, Greg Brandeau, Emily Truelove, Kent Lineback
10. Change by Design, by Tim Brown
11. Unmukt-Science and Art of Design Thinking Authors Arun Jain School of Design Thinking 2019
12. The Design Thinking Play Book by Michael Lewrick, Patrick Link& Larry Leifer, Wiley Press,2018
13. The Design of Business: Why Design Thinking Is the Next Competitive Advantage. Martin, R. (2009). Boston, MA: Harvard Business Press.

Online Resources:

1. https://www.interaction-design.org/literature/topics/design-thinking
2. https://www.interaction-design.org/literature/article/how-to-develop-an-empathic-approach-in-design-thinking
3. https://medium.com/dc-design/what-is-human-centered-design-6711c09e2779
4. https://think.design/user-design-research/user-testing/
5. Mentor-DesignThinking.pdf (aim.gov.in)
6. Mentor-DesignThinking.pdf (aim.gov.in)

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CST12	Cryptography and Network Security	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Computer Networks

Course Objectives:

1. The main objective of this course is to teach students to understand and how to address various software security problems in a secure and controlled environment.
2. During this course the students will gain knowledge in various kinds of software security problems, and techniques that could be used to protect the software from security threats.

Course Outcomes:

1. Evaluate the use of encryption algorithms for achieving data confidentiality.
2. Apply Secure hash functions for attaining data integrity.
3. Explain IP security issues and protection mechanisms to secure Emails.
4. Demonstrate the techniques of web security.
5. Examine the threats and remedial measures for system security.

UNIT–I: (10 Lectures)

Introduction: Security Attacks(Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, Access Control and Availability) and Mechanisms, A Model for Internetwork security.

Symmetric Key Cryptography: Symmetric Encryption Principles, Symmetric Encryption Algorithms (DES,Triple DES and AES), Cipher Block Modes of Operations.

UNIT–II: (8 Lectures)

Public-Key Cryptography and Message Authentication: Approaches to Message Authentication, Secure Hash Functions, Message Authentication Codes, Public-Key Cryptography Principles, Public-Key Cryptography Algorithms, Digital Signatures.

UNIT–III: (9 Lectures)

Electronic Mail Security: Pretty Good Privacy (PGP) and S/MIME.

IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange.

UNIT–IV: (9 Lectures)

Web Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).

UNIT–V: **(9 Lectures)**

Intruders and Malicious Software: Intruders, Intrusion Detection, Viruses and Related Threats, Trusted System.

Firewalls: Firewalls-Characteristics, Types of Firewalls, Placement of Firewalls, Firewall Configuration.

Text Books:

1. William Stallings, Principles and Practice "Cryptography and Network Security" ,6th Edition, Pearson Education,2011.
2. William Stallings, Network Security Essentials (Applications and Standards), Pearson Education, 2010.
3. Chwan Hwa Wu, J.David Irwin,Introduction to Computer Networks & Cyber Security CRC Press, 2013.

References:

1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press), 2015.
2. Principles of Information Security, Withman , Thomson, 2017.
3. Introduction to Cryptography, Buchmann, Springer, 2010.

Web References:

1. https://onlinecourses.nptel.ac.in/noc18_cs07/preview
2. https://www.coursera.org/learn/cryptography
3. https://www.coursera.org/specializations/computer-network-security

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CST13	Advanced Java & Web Technologies	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Front end Web Technologies

Course Objectives:

1. To gain the knowledge of Server-side programming languages and techniques associated with the World Wide Web.
2. To make the students get acquainted the skill for developing web apps.
3. Understand how to use web-based media-rich programming tools for creating dynamic web pages.

Course Outcomes:

1. Interpret Servlet Life Cycle and web servers.
2. Illustrate JSP Life cycle.
3. Apply Session Management for JSP applications.
4. Illustrate the usage of JDBC in JSP applications.
5. Make use of PHP for the development of web-based applications.

UNIT–I: (9 Lectures)

Web Servers and Servlets: Tomcat web server, introducing java Servlet, Introducing the servlet API, Lifecycle of a Servlet, Working with Initialization Parameters, Describing the HttpServletRequest & HttpServletResponse interfaces, Cookies, Session Tracking, Security Issues.

UNIT–II: (10 Lectures)

Introduction to JSP: The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing. JSP Application Design with MVC. JSP Application Development: Generating Dynamic Content: directive elements, what is template text, action elements. Using Scripting Elements, Implicit JSP Objects. Conditional Processing: Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods.

UNIT–III: (8 Lectures)

JSP: Error Handling and Debugging, Implicit JSP Objects, Sharing Data between JSP pages, Requests, and Users Passing Control and Data between Pages: passing the control between the pages, passing the data between JSP pages passing the data between JSP pages using session object, Memory Usage Considerations.

UNIT–IV: (9 Lectures)

JDBC: Introduction, Database Programming Using JDBC: How JDBC Works, JDBC Architecture, JDBC Driver Types, Accessing Database From JSP page: Use of Prepared Statement, ResultSet.

UNIT–V: **(9 Lectures)**

PHP: Introduction to PHP, Creating PHP script, Running PHP script. Working with variables and constants, Data types, Operators. Controlling program flow, Working with Arrays, Built-in functions in PHP, user-defined functions in PHP, recursive, variable, and callback functions. User and Database Interface: Database programming, Working with forms, validating a form, Working with Databases such as MySQL

Text Books:

1. A.A. Puntambekar , "Web Technologies" , Technical Publications, Pune, 2017.
2. "Web Technologies Black Book" , Kognent Learning Solutions Inc Sol. DreamTech Press, 2009.

References:

1. Wang Thomson, "An Introduction to Web Design and Programming", 2004.
2. Wang, Katila, "An Introduction to Web Design Programming", 2004.
3. Web Technologies A Developer's Perspective, N.P.Gopalan, Akhilandeswari, PHI, 2014.

Web References:

1. https://www.coursera.org/learn/html-css-javascript-for-web-developers.
2. https://www.udemy.com/javawebtut/.
3. https://www.coursera.org/learn/web-applications-php.
4. https://www.coursera.org/learn/desenvolvimento-agil-com-java-avancado/lecture/LUXm0/criando-javaservlets.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CST14	Automata Theory & Compiler Design	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Programming Languages, computer architecture, data structures and simple graph algorithms, logic or algebra.

Course Objectives:

1. To understand the various phases in the design of a compiler.
2. To understand the design of top-down and bottom-up parsers.
3. To understand syntax directed translation schemes.
4. To introduce lex and yacc tools.
5. To learn to develop algorithms to generate code for a target machine.

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

1. Read and write finite automata and grammars for programming language constructs.
2. Design finite automata for regular languages.
3. Generate grammar for a given language
4. Able to use lex and yacc tools for developing a scanner and a parser.
5. Able to design and implement parsers.

UNIT–I: (9 Lectures)

Fundamentals: Introduction, Basic Concepts, Introduction to Formal Proofs, Inductive proofs, Introduction to Defining Language, Kleen Closures, Arithmetic Expressions, Graphs, Trees, Finite State Machine, Acceptance of Strings and Languages, Deterministic Finite Automata, Non-Deterministic Finite Automata.

UNIT–II: (9 Lectures)

Finite Automata: Introduction, Significance of Nondeterministic Finite Automation, NFA with ϵ – Transactions, Conversions and Equivalence , NFA to DFA Conversion, Minimization of FSM, Equivalence between Two FSMs.

UNIT–III: (9 Lectures)

Grammar Formalism: Introduction, Regular Grammar, Equivalence between Regular Grammar and FA, Conversation of Right – Linear Grammar to Left Linear Grammar, Context Free Grammar.

Overview of Language Processing: Introduction, Preprocessors, Compiler, Assembler, Interpreters, Linkers and loaders, structure of compiler, Phases of compiler

UNIT–IV: (8 Lectures)

Lexical Analysis : Introduction , Role of Lexical Analysis, Lexical Analysis Vs Parsing, Token, Patterns and Lexeme, Lexical Errors, Input Buffering, Regular Expressions

UNIT–V: (9 Lectures)

Syntax Analysis : Introduction, Role of Parser, Context Free Grammar(CFG), Classification of Parsing Techniques, Top Down Parsing, Recursive Descent Parser

Text Books:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman (2007), Introduction to Automata Theory Languages andComputation, 3rdedition, Pearson Education, India.
2. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson, 2007.

REFERENCE BOOKS:

1. K. L. P Mishra, N. Chandrashekaran (2003), Theory of Computer Science-Automata Languages and Computation, 2nd edition, Prentice Hall of India, India.
2. Compiler Construction-Principles and Practice, Kenneth C Louden, Cengage Learning, 1997.
3. Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press, 2000.
4. Formal Languages & Automata Theory, A.A.Puntambekar, First Edition, Technical Publications.
5. Compiler Design, Ajit Singh, 2019.

Web References:

1. https://archive.nptel.ac.in/courses/111/103/111103016/
2. https://archive.nptel.ac.in/courses/106/104/106104123/

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CSE05	Distributed Systems	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Operating Systems.

Course Objectives:

1. To introduce the fundamentals of distributed systems.
2. To expose current technology to build architectures for enhancing distributed computing infrastructures with various computing principles.

Course Outcomes:

1. Describe the important characteristics of distributed systems and the salient features of architectural models.
2. Apply inter-process communication in a distributed environment.
3. Implement the RMI and RPC for different case studies. A
4. Analyze how operating systems can support distributed systems.
5. Develop a familiarity with distributed file systems and also synchronization algorithms distinguish between active replication and passive replication.

UNIT–I: (9 Lectures)

Characterization of Distributed Systems: Introduction, Examples of Distributed Systems, Challenges.

System Models: Introduction, Architectural Models, Design Requirements for Distributed Architectures, Fundamental Models- Interaction Model, Failure Model, Security Model.

UNIT–II: (9 Lectures)

Interprocess Communication: Introduction, the API for the internet protocols- the characteristics of inter process communication, sockets, UDP datagram communication, TCP stream communication; Client server communication.

UNIT–III: (9 Lectures)

Distributed Objects and Remote Invocation: Introduction, Communication between Distributed Objects- Object Model, Distributed Object Modal, Design Issues for RMI, Invocation Semantics, Implementation of RMI, Distributed Garbage Collection; Remote Procedure Call, Case Study: JAVA RMI.

UNIT–IV: (8 Lectures)

Distributed File Systems: Introduction, File Service Architecture; Peer-to-Peer Systems: Introduction, Napster and its Legacy, Peer-to-Peer Middleware,

Coordination and Agreement: Introduction, Distributed Mutual Exclusion, Elections.

UNIT–V: (9 Lectures)

Transactions & Replications: Introduction, System Model and Group Communication, Concurrency Control in Distributed Transactions, Distributed DeadLocks, Transaction Recovery; Replication-Introduction, Passive (Primary) Replication, Active Replication.

Text Books:

1. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems: Concepts and Design", 2nd edition, Pearson, 2010.
2. Andrew S. Tanenbaum, "Distributed Operating Systems", Pearson Education, 2011.

REFERENCE BOOKS:

1. Andrew S. Tanenbaum, Maarten Van Steen, "Distributed Systems Principles and Paradigms", 2nd edition, Pearson Prentice Hall, 2011.
2. Ajay D Kshemkalyani, Mukesh Singhal, "Distributed Computing, Principles, Algorithms and Systems", Cambridge, 2015.

Web References:

1. nptel.ac.in/courses/106106168/
2. http://db.uwaterloo.ca/~tozsu/courses/cs454
3. http://cse.iitkgp.ac.in/~agupta/distsys/index.html
4. http://www.cis.upenn.edu/~lee/03cse380/lectures/ln19-ds-v3.4pp.pdf
5. http://www.cloudbus.org/652/LectureSlides.html.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CSE06	Wireless Networks & Mobile Computing	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: NIL

Course Objectives:

1. To make the student understand the concept of mobile computing paradigm, its applications and limitations.
2. To understand the typical mobile networking infrastructure through GSM.
3. To understand the issues and solutions of various layers of mobile networks, namely MAC layer, Network Layer & Transport Layer.
4. To understand the ad hoc networks and related concepts.

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

1. Compare the various types of Wireless Networks from teaching perspective.
2. Interpret the applications and architecture of Mobile Computing and multiplexing techniques.
3. Analyze the Mobile IP issues.
4. Analyze the various Mobile TCP Variants.
5. Analyze the various routing protocols in MANET.

UNIT–I: (8 Lectures)

Wireless Networks: Computing Networks, types of networks, wired networks, wireless networks, Generation of Wireless Networks: 2G, 3G, 4G, Cellular Networks, Mobile Ad Hoc Networks, Mesh Networks, Sensor Networks, Vehicular Adhoc Networks, Next Generation Networks.

UNIT–II: (9 Lectures)

Mobile Computing: Architecture of Mobile Computing, Mobile Computing Applications, Limitations of Mobile Devices GSM: Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS.

UNIT–III: (12 Lectures)

(Wireless) Medium Access Control (MAC): Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA. Mobile Network Layer: Mobile IP- Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunnelling and encapsulation, optimizations, Dynamic Host Configuration Protocol (DHCP).

UNIT–IV: (8 Lectures)

Mobile Transport Layer : Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

UNIT–V: (8 Lectures)

Mobile Ad hoc Networks (MANETs): Introduction, Characteristics, Applications & Challenges of a MANET, Routing, Proactive, Reactive and Hybrid Routing Algorithms.

Text Books:

1. Jochen Schiller, "Mobile Communications", Addison-Wesley, 2nd edition, 2004.
2. Rajkamal, "Mobile computing" Second Edition ,Oxford University Press.

REFERENCE BOOKS:

1. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley, 2002, ISBN 0471419028.
2. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden ,Schwiebert, Loren, "Fundamentals of Mobile and Pervasive Computing", ISBN: 0071412379, McGraw-Hill Professional, 2005.
3. Hansmann, Merk, Nicklous, Stober, "Principles of Mobile Computing", Springer, second edition, 2003.
4. MartynMallick, "Mobile and Wireless Design Essentials", Wiley DreamTech, 2003.

Web References:

1. https://www.youtube.com/watch?v=Eu_mTZxPofI
2. https://slideplayer.com/slide/4810167/
3. https://www.tutorialspoint.com/mobile_computing/mobile_computing_useful_resources.htm.
4. http://www.freepdfbook.com/mobile-communications-jochen-schiller/

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CSE07	Deep Learning	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: NILL

Course Objectives:

1. Understand complexity of Deep Learning algorithms and their limitations.
2. Understand modern notions in data analysis oriented computing.
3. Be capable of confidently applying common Deep Learning algorithms in practice and implementing their own.
4. Be capable of performing distributed computations.
5. Be capable of performing experiments in Deep Learning using real-world data.

Course Outcomes:

1. Implement deep learning algorithms, understand neural networks and traverse the layers of data abstraction which will empower the student to understand data more precisely.
2. Learn topics such as convolution neural networks, recurrent neural networks, training deep networks and high-level interfaces.
3. Understand the language and fundamental concepts of artificial neural networks.
4. Implement Neural Network models and its variant models.
5. Infer to the deep learning and its applications.

UNIT–I: (9 Lectures)

Introduction to Machine Learning : Supervised and Unsupervised learning,Linear Models, Perceptrons: What is a Perceptron, XOR Gate Introduction to TensorFlow : Computational Graph, Key highlights, Creating a Graph, Regression example.

UNIT–II: (9 Lectures)

Activation Functions : Sigmoid,ReLU, Hyperbolic Fns,Softmax Artificial Neural Networks : Introduction, Perceptron Training Rule, Gradient Descent Rule. Gradient Descent and Backpropagation: Gradient Descent, Stochastic Gradient Descent, Backpropagation, Some problems in ANN.

UNIT–III: (10 Lectures)

Optimization and Regularization : Overfitting and Capacity, Cross Validation,Feature Selection, Regularization, Hyperparameters Autoencoders (standard, sparse, denoising, contractive, etc), Adversarial Generative Networks, Autoencoder and DBM.

UNIT–IV: (9 Lectures)

Introduction to Convolutional Neural Networks: Introduction to CNNs, Kernel filter, Principles behind CNNs, Multiple Filters, CNN applications Introduction to Recurrent Neural Networks: Introduction to RNNs, Unfolded RNNs, Seq2Seq RNNs, LSTM, RNN applications.

UNIT–V: (8 Lectures)

Deep Learning applications: Image Processing, Natural Language Processing, Speech Recognition, Video Analytics.

Text Books:

1. Goodfellow, I., Bengio, Y., and Courville, A., Deep Learning, MIT Press, 2016.

Reference Books:

1. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
2. Golub, G., H., and Van Loan, C., F., Matrix Computations, JHU Press, 2013.
3. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw- Hill Education, 2004.

Web References:

1. .https://www.ibm.com/cloud/learn/deep-learning
2. https://en.wikipedia.org/wiki/Deep_learning
3. https://www.geeksforgeeks.org/introduction-deep-learning/

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CSE08	Information Retrieval Systems	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Database Management Systems

Course Objectives:

1. To introduce basic concepts in information retrieval.
2. To familiarize with applications of information retrieval techniques in the Internet or Web environment

Course Outcomes:

1. Identify the basic theories in information retrieval systems.
2. Use inverted file as an index data structure to retrieve the documents from the database.
3. Create signature files for fast retrieval of text data.
4. Build PAT trees and PAT arrays for the given text document.
5. Use stemming algorithms to improve the performance of IR systems.

UNIT–I: (9 Lectures)

Introduction to Information Storage and Retrieval System:

Introduction, Domain Analysis of IR systems and other types of Information Systems, IR System Evaluation. Introduction to Data Structures and Algorithms related to Information Retrieval: Basic Concepts, Data structures, Algorithms.

UNIT–II: (9 Lectures)

Inverted files:

Introduction, Structures used in Inverted Files, Building Inverted file using a sorted array, Modifications to Basic Techniques.

UNIT–III: (9 Lectures)

Signature Files:

Introduction, Concepts of Signature Files, Compression, Vertical Partitioning, Horizontal Partitioning.

UNIT–IV: (8 Lectures)

New Indices for Text:

PAT Trees and PAT Arrays: Introduction, PAT Tree structure, algorithms on the PAT Trees, Building PAT trees as PATRICA Trees, PAT representation as arrays.

UNIT–V: (8 Lectures)

Stemming Algorithms:

Introduction, Types of Stemming Algorithms, Experimental Evaluations of Stemming to Compress Inverted Files.

Text Books:

1. Frakes W.B., Ricardo Baeza-Yates, “Information Retrieval Data Structures and Algorithms”, Prentice Hall, 1992.
2. Ricardo Baeza-Yates, Bertheir Ribeiro-Neto, “Modern Information Retrieval”, Pearson Education, 1999.
3. Robert Korfhage, “Information Storage & Retrieval”, John Wiley & Sons, 2006.

REFERENCES:

1. Kowalski, Gerald, Mark T Maybury, “Information Retrieval Systems-Theory and Implementation”, Kluwer Academic Press, 1997.
2. Information retrieval Algorithms and Heuristics, David A. Grossman, Ophir Frieder, 2012.

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CSL09	Software Lab-I	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Objectives:

1. Learn how to build a data warehouse and query it.
2. Learn to perform data mining tasks using a data mining toolkit (such as open source WEKA).
3. Understand the data sets and data preprocessing.
4. To familiarize the basic concepts of Hadoop and its eco system.
5. To develop programs using Map Reduce, PIG and HIVE.

Course Outcomes:

1. Ability to add mining algorithms as a component to the existing tools.
2. Apply suitable LINUX commands to work in Hadoop environment.
3. Use HDFS file structure and Map Reduce framework to solve complex problems.
4. Analyze data using Pig and Hive.

List of Experiments:

1. Installation of WEKA Tool.
2. Creating new Arff File.
3. Pre-Processes Techniques on Data Set and Pre-process a given dataset based on Handling Missing Values.
4. OLAP Cube and its different operations
5. Create Student. ariff file to suggest better college using Decision tree
6. Create Placement.ariff file to identify the students who are eligible for placements using KNN.
7. Practice on basic Linux commands.
8. Implement the following file management tasks in Hadoop:
   (a) Adding files and Directories
   (b) Retrieving files
   (c) Deleting files
   (d) Moving files

(e) Copying files from local filesystem to HDFS and vice versa.

9. Write driver code, mapper code, reducer code to count number of words in a given file. (Hint: WordCount Map- Reduce Program)
10. Implement Matrix Multiplication with Hadoop Map Reduce.
11. Install Pig and write Pig latin scripts to Load , aStore and Filter data.
12. Install Hiveand use Hive to create databases and tables
    (a) Create and drop databases
    (b) Create, alter, and drop tables
    (c) Insert, Update and delete records

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CSL10	Advanced Java & Web Technologies Lab	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Outcomes:

1. Experiment with the installation of Web Servers.
2. Make use of servlets in dynamic web pages.
3. Develop web applications using JSP for effective data management.
4. Construct the web based applications in PHP using effective database access with rich client interaction.

List of Experiments:

1. Install TOMCAT web server and Apache- MySQL.
2. Write a servlet program which receives data from HTML forms and responds to it.
3. Create one Servlet to retrieve “ServletContext Initialization Parameters“ which you have given in the web.xml file.
4. Write a servlet program to authenticate four users using cookies.
5. Write a servlet that, on entry of a student roll no, displays the full details of that student’s details(Using student table with roll no, Name, Address, date of birth, course fields).
6. Write a JSP program to register a student using a registration form using the student table.
7. Write a JSP program for authenticating a user by his password using login form, create suitable tables.
8. Create a table to store the details of the book(book name, price, author, publisher) and extract data from the table and display all books using JSP and JDBC.
9. Write PHP programs that use arrays and functions in PHP.
10. Write an example PHP program for creating login form and validate users.
11. Write an example PHP program to display all students in cse using the student table.
12. Create tables in a database which contains the details of the book .Extract data from tables and display them using PHP.

Course Code	Course Name	Course Structure			
P21CSL11	UML Lab	L	T	P	C
		0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Prerequisite: Object Oriented Programming concepts

Course Objectives:

The objective of this lab is

1. To know the practical issues of the different object-oriented analysis and design concepts.
2. Inculcate the art of object-oriented software analysis and design.
3. Apply forward and reverse engineering of a software system.
4. Carry out the analysis and design of a system in an object-oriented way.

Course Outcomes:

1. Know the syntax of different UML diagram
2. Create use case documents that capture requirements for a software system.
3. Create class diagrams that model both the domain model and design model of a software system.
4. Create interaction diagrams that model the dynamic aspects of a software system.
5. Develop simple applications

Note: For performing the experiments consider any case study (ATM/ Banking / Library / Hospital management systems)

List of Experiments:

Excercise 1:

(Familiarization with Rational Rose or Umbrella environment

Excercise 2:

1. Identify and analyze events
2. Identify Use cases
3. Develop event table

Excercise 3:

1. Identify & analyze domain classes
2. Represent use cases and a domain class diagram using Rational Rose
3. Develop CRUD matrix to represent relationships between use cases and problem domain classes

Excercise 4:

1. Develop Use case diagrams

2. Develop elaborate Use case descriptions & scenarios

Excercise 5:

1. Develop system sequence diagrams and high-level sequence diagrams for each use case
2. Identify MVC classes / objects for each use case
3. Develop Detailed Sequence Diagrams / Communication diagrams for each use case showing interactions among all the three-layer objects

Excercise 6:

1. Develop detailed design class model (use GRASP patterns for responsibility assignment)
2. Develop three-layer package diagrams for each case study

Excercise 7:

1. Develop Use case Packages
2. Develop component diagrams
3. Identify relationships between use cases and represent them
4. Refine domain class model by showing all the associations among classes

Excercise 8:

Develop sample diagrams for other UML diagrams - state chart diagrams, activity diagrams and deployment diagrams.