ACADEMIC REGULATIONS
COURSE STRUCTURE

AND

DETAILED SYLLABUS
(I YEAR & II YEAR)

COMPUTER SCIENCE & ENGINEERING
(ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

FOR
B.TECH FOUR YEAR DEGREE COURSE
(Applicable for the batches admitted from 2020-2021)

G. NARAYANAMMA INSTITUTE OF TECHNOLOGY & SCIENCE
(For Women)

(Autonomous)
Shaikpet, Hyderabad– 500104

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B.TECH-ACADEMIC REGULATIONS
(GNITS-R18)
For CBCS Based B.Tech. Degree Courses

(Applicable for the students of B.Tech (Regular) from the Academic Year **2020-21** and onwards)

1.0 Under-Graduate Degree Course (UGDC) in Engineering & Technology (E&T)

G. Narayanamma Institute of Technology & Science (GNITS) - for Women, Hyderabad, affiliated to Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, offers 4 Year (8 Semesters) **Bachelor of Technology** (B.Tech.) Degree Course under Choice Based Credit System (CBCS) with effect from the Academic Year **2020-21** onwards in the following Branches of Engineering & Technology:

S.No.	***Branch***
I.	Computer Science & Engineering **(CSE)**
II.	Computer Science & Engineering (Artificial Intelligence & Machine Learning) **(CSM)**
III.	Computer Science & Engineering (Data Science) **(CSD)**
IV.	Electrical & Electronics Engineering **(EEE)**
V.	Electronics & Communication Engineering **(ECE)**
VI.	Electronics & Telematics Engineering **(ETE)**
VII.	Information Technology **(IT)**
VIII.	Computer Science and Technology **(CST)**

2.0 Eligibility for Admission

2.1 The Admission to the UGDC shall be made either on the basis of the merit rank obtained by the qualifying candidate at an Entrance Test conducted by the Telangana State Government (TSEAMCET), OR the University, OR on the basis of any other order of merit approved by the University, subject to the reservations as prescribed by the Government from time to time.

2.2 The medium of instruction for the entire UG Degree Course in E&T shall be ENGLISH only.

3.0 B.Tech. Degree Course Structure

3.1 The B.Tech. Degree Courses at GNITS are of Semester Pattern, with 8 Semesters constituting 4 Academic Years and each Academic Year is of TWO Semesters (First/Odd and Second/Even Semesters). Each Semester shall be of 22 Weeks duration (inclusive of Examinations), with a minimum of 90 Instructional Days per Semester.

3.2 UGC/AICTE specified Definitions/Descriptions are adopted appropriately for various terms and abbreviations used in these Academic Regulations/ Norms, which are listed under **3.2.1 to 3.2.4**. The Course Structure is organized based on the AICTE Model Curriculum for Under-Graduate Degree Courses in Engineering & Technology (Jan. 2018).

3.2.1 Semester Scheme:

Each UGDC is of 4 Academic Years (8 Semesters), with each academic year divided into two semesters of 22 weeks (≥90 working days) each. Each semester has - 'Continuous Internal Evaluation (CIE)' and 'End Semester Examination or Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as denoted by UGC, and Course Structure/Curriculum as suggested by AICTE are followed. The terms 'SUBJECT' or 'COURSE' imply the same meaning here, and refers to 'Theory Subject', or 'Lab/Practical Course', or 'Design/ Drawing Subject', or 'Elective', or 'Seminar', or 'Project', or 'Mini-Project', as the case may be.

3.2.2 Credit Courses

All the Subjects/ Courses are to be registered by a student in a Semester to earn Credits. Credits shall be assigned to each Subject/ Course in a **L : T : P : C** (**L**ecture Periods : **T**utorial Periods : **P**ractical Periods : **C**redits) Structure based on the following general pattern:

- One Credit - for One hour/ Week/ Semester for Theory/ Lecture (L) Courses, and Tutorials (T); and,
- One Credit - for Two hours/ Week/ Semester for Laboratory/ Practical (P) Courses.

Student Activity Courses like NCC, NSS, NSO, and other courses identified as Mandatory Courses (MC) shall not carry Credits.

3.2.3 Subject/ Course Classification

All the Subjects/ Courses offered for the UGDC are broadly classified as :

(a) Foundation Courses (FnC), (b) Core Courses (CoC), and (c) Elective Courses (ElC).

- Foundation Courses (FnC) are further categorized as :
  - (i) HS (Humanities and Social Sciences including Management Courses),
  - (ii) BS (Basic Sciences Courses), and
  - (iii) ES (Engineering Sciences Courses);
- Core Courses (CoC) and Elective Courses (ElC) are categorized as PS (Professional Subjects), which are further subdivided as:
  - (i) PC (Professional/ Departmental Core) Courses
  - (ii) PE (Professional/ Departmental Electives) Courses
  - (iii) OE (Open Electives) Courses; and
  - (iv) Project Works (PW);
- Additional Courses :
  - ONLINE Courses (offered by IITs/ MOOCs) ; and
- Mandatory Courses :
  - MC - No Credits allocated.

3.2.4 Course Nomenclature:

The Curriculum Nomenclature or Course Structure Grouping for each UG Degree Course (B.Tech. Degree Programmes) is as listed below (along with AICTE specified % Range of Total Credits):

S. No	*Broad Course Classification*	*Course Group/ Category*	*Course Description*	*Range of Credits & AICTE Model Credits*
1)	**Foundation Courses (FnC)**	**BS – Basic Sciences**	Include - Mathematics, Physics, Chemistry, Biology Subjects	**15% - 20%**
2)		**ES - Engineering Sciences**	Include fundamental engineering subjects	**15% - 20%**
3)		**HS – Humanities & Social Sciences**	Include subjects related to Humanities, Social Sciences and Management	**5% - 10%**
4)	**Core Courses (CoC)**	**PC – Professional Core**	Include core subjects related to the Parent Department/ Branch of Engg.	**30% - 40%**
5)	**Elective Courses (ElC)**	**PE – Professional Electives**	Include Elective subjects related to the Parent Department/ Branch of Engg.	**10% - 15%**
6)		**OE – Open Electives**	Elective subjects include subjects from other technical and/ or Emerging Subject Areas	**5% - 10%**
7)	**Projects Related Courses (PW)**	**Project Work**	B.Tech. Project or UG Project or UG Major Project	**10% - 15%**
8)		**Mini-Project**	Mini-Project/Industrial Training / Internship/ UG Mini-Project	
9)		**Seminar**	Seminar based on core contents related to Parent Department/ Branch of Engg.	
10)	**Mandatory Courses**	**MC**	Mandatory Courses	**Non-Credit**
11)	**Additional Courses**	**ONLINE Courses**	Offered by IITs/ MOOCs	Optional
Total Credits for UGDC (B. Tech.) Programme				**160 (100%)**

4.0 Course Work

4.1 A student after securing admission shall pursue the B.Tech. UG Degree Course in a minimum period of 4 Academic Years, and a maximum period of 8 Academic Years (with effect from the Date of Commencement of I Year).

4.2 As suggested by AICTE, a 3-week 'Mandatory Induction Programme' shall be offered for all the Branches of Engineering at the start of the I Year UGDC, to enable the newly admitted students get acquainted with the new professional environment, to develop awareness and understanding of the engineering education requirements, and to get them prepared for the academic schedules ahead. The features, activities and pattern of the Induction Programme shall be as per the guidelines suggested in the Model Curriculum. Conventional class work shall commence only after the completion of the Induction Programme.

4.3 Each student shall Register for and secure the specified number of Credits (160 Credits) required for the completion of the UGDC and the Award of the B.Tech. Degree in the respective Branch of Engineering.

4.4 Each Semester is structured to provide typically about 20 Credits (20 C) on an average, totaling to 160 Credits (160 C) for the entire B.Tech. Programme.

5.0 Course Registration

5.1 A 'Faculty Advisor or Counselor' shall be assigned to each B.Tech student and the faculty advisor assigned shall advise/counsel the student about the UGD Course, its Course Structure and Curriculum, Choice/Option for Subjects/Courses, based on the competence, progress, pre-requisites and interest of the student.

5.2 The Academic/Examination Section of the College invites 'Registration Forms' from the students apriori (before the beginning of the Semester) through 'ONLINE SUBMISSIONS', ensuring 'DATE and TIME Stamping'. The ONLINE Registration Requests for any 'CURRENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the 'PRECEDING SEMESTER'.

5.3 Every individual student is advised to register for all the number of credits indicated in that semester workload of the respective UGD Course Structure - this is termed as the 'Minimum Work Load' (MWL).

5.4 A student can apply for ONLINE Registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from her assigned Faculty Advisor, which should be submitted to the College Academic/Examination Section through the Head of the Department (a copy of the same is to be retained by the Head of the Department, Faculty Advisor and the student).

5.5 A student may be permitted to register for the Subjects/ Courses of her choice with the typical work load suggested in the respective semester credit load allocation of that UG Degree Course Structure as the Minimum Work Load (MWL), and maximum – with possible additional courses of her choice, limited to a Total Work Load (TWL) of 25 C, based on her PROGRESS and SGPA/ CGPA, and completion of the 'PRE-REQUISITES' as indicated for various Subjects/ Courses in the Department Course Structure and Syllabus contents.

5.6 The choice for the 'additional' Subjects/Courses to reach the Maximum Permissible Limit of 25 Credits (above the typical MWL) must be indicated clearly, which needs

the specific approval and signature of the Faculty Advisor/ Counselor and the HoD on the hard-copy.

5.7 If the student submits ambiguous choices or multiple options or erroneous entries during ONLINE Registration for the Subject(s) / Course(s) under a given/ specified Course Group/ Category as listed in the Course Structure, only the first mentioned Subject/ Course in that category shall be taken into consideration, as applicable.

5.8 The Subject/Course Options exercised through ONLINE Registration are final and CANNOT be changed, and CANNOT be inter-changed; further, alternate choices shall also be not considered. However, if the Subject/ Course that has already been listed for Registration (by the Head of the Department) in a semester could not be offered on account of any unforeseen or unavoidable reasons, then the student shall be allowed to have alternate choice - either for a new Subject (subject to offering of such a Subject), or for another existing Subject (subject to availability of seats), which may be considered. Such alternate arrangements shall be made by the Head of the Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of class-work for that semester.

5.9 Dropping of the Subjects/ Courses may be permitted ONLY AFTER obtaining the prior approval from the Faculty Advisor assigned (subject to the retaining of the MWL), 'within 15 Days of Time' from the beginning of the current semester.

5.10 For the Mandatory Courses (like NCC/ NSS/ NSO etc.), a 'Satisfactory Participation Certificate' from the concerned authorities of the relevant semester is essential. No Marks or Grades or Credits shall be awarded for the Mandatory Courses.

6.0 Subjects/ Courses to be offered

6.1 A typical Section strength (or Class strength) for each semester shall be 60.

6.2 A Subject/ Course may be offered to the students, ONLY IF a Minimum of 30 Students opt for the same. The Maximum Class Strength of a Section is limited to 80.

6.3 More than ONE TEACHER may offer the SAME SUBJECT (Theory/ Tutorials/Lab./Practicals) in any semester. However, selection choice for students will be based on - 'FIRST COME FIRST SERVE Basis and CGPA Criterion' (ie., the first focus shall be on the earliest stamping of ONLINE ENTRY from the student for Registration in that semester, and the second focus, if needed, shall be on the existing CGPA of the student).

6.4 If more entries for the Registration of a Subject come into picture, then the Head of the Department concerned shall take necessary action, whether to offer such a Subject/ Course for TWO (or multiple) SECTIONS or NOT .

6.5 In case of the options coming from the students of the other Departments/ Branches/ Disciplines also (not considering OPEN ELECTIVES), PRIORITY shall be given to the student of the 'Parent Department/Branch' first.

7.0 Attendance Requirements

7.1 A student shall be eligible to appear for the End Semester Examinations if she acquires a minimum of 75% of attendance in aggregate of all the Subjects/Courses (excluding Mandatory or Non-Credit Courses) for that semester.

7.2 Condoning of shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each semester may be granted by the College Academic Committee (CAC) on genuine and valid grounds based on the student's representation with supporting evidence. Provision of such condonation is however limited to a maximum of 3 times during the maximum permissible UG study period.

7.3 A stipulated fee shall be payable towards condoning of shortage of attendance.

7.4 Shortage of Attendance below 65% in aggregate shall in NO case be condoned.

7.5 A student, whose shortage of attendance is not condoned in a semester is not eligible to take her End Examinations of that semester; she get detained and her registration for that semester shall stand cancelled. She shall not be promoted to the next semester. She may seek re-registration for all those Subjects registered in that semester in which she gets detained by seeking re-admission for that semester as and when offered; in case if there are any Professional Electives and/ or Open Electives, the same may also be re-registered if offered, however, if those Electives are not offered in later semesters, then alternate Electives may be chosen from the same set of Elective Subjects offered under that Elective category.

8.0 Academic Requirements

The following Academic Requirements have to be satisfied in addition to the Attendance Requirements mentioned under Clause 7.0.

8.1 A student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to each Subject/ Course, if she secures not less than 35% marks (25 out of 70 marks) in the End Semester Examination, and a minimum of 40% of marks in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together [in terms of Letter Grades, this implies securing '**C** Grade' or above in that Subject/ Course].

8.2 A student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to the Seminar and the Mini-Project, if she secures not less than 40% of the total marks (that is, 40 marks) to be awarded for each. The student would be treated as failed, if she - (i) does not submit a report on her Mini-Project, or does not make a presentation of the same before the Evaluation Committee as per the schedule, or (ii) does not present the Seminar as required in the III year II Semester, or (iii) secures less than 40% of marks (40 marks) in the Mini-Project/ Seminar evaluations. She may have to reappear for the Mini-Project/ Seminar evaluations, when they are scheduled again in that semester; if she fails in such 'one reappearance' evaluation also, she has to reappear for the same in the next subsequent semester, as and when they are scheduled as supplementary candidate.

8.3 A student will not be promoted from the I Year to the II Year, unless she fulfills the Attendance and Academic Requirements and secures a total of 19 Credits out of 38 Credits specified for the I Year, from all the relevant regular and supplementary examinations, whether she takes those examinations or not.

8.4 A student will not be promoted from the II Year to the III Year, unless she fulfills the Attendance and Academic Requirements and secures a total of 47 Credits out of 79 Credits specified up to and inclusive of the II Year II Semester, from all the

relevant regular and supplementary examinations, whether she takes those examinations or not.

8.5 A student will not be promoted from the III Year to the IV Year, unless she fulfils the Attendance and Academic Requirements and secures a total of 71 Credits out of 119 Credits specified up to and inclusive of the III Year II Semester, from all the relevant regular and supplementary examinations, whether she takes those examinations or not.

8.6 A student shall register for all the Subjects covering 160 Credits as specified and listed (with the relevant Course/ Subject Classifications as mentioned) in the Course Structure, puts up all the Attendance and Academic requirements for 160 Credits securing a minimum of C Grade (Pass Grade) or above in each Subject, and earns ALL 160 Credits securing SGPA ≥ 5.0 (in each semester), and CGPA (at the end of each successive semester) ≥ 5.0 to successfully complete the UG Degree Course.

8.7 If a student registers for any 'additional Subjects' (in the parent Department or other Departments/Branches of Engg.) other than those listed Subjects totaling to 160 Credits as specified in the Course Structure of her Department, the performances in those 'additional Subjects' (although evaluated and graded) shall not be taken into account while calculating the SGPA and CGPA. For such 'additional Subjects' registered, the Letter Grade alone shall be indicated in the Grade Card as a performance measure subject to the completion of the Attendance and Academic Requirements as stated under Clauses 7.0 and 8.1 – 8.6.

8.8 Students who fail to earn 160 Credits as per the Course Structure, and as indicated above, within 8 Academic Years from the Date of the Commencement of their I Year, shall forfeit their seats in B.Tech. Programme and their admission shall stand cancelled.

8.9 When a student is detained due to the shortage of attendance in any semester, she may be re-admitted into that semester as and when offered, along with the Academic Regulations of the Batch into which she gets readmitted. However, no Grade Allotments or SGPA/ CGPA calculations shall be done for that entire semester in which she got detained.

8.10 When a student is detained due to lack of Credits in any year, she may be readmitted in the next year(s), after the fulfillment of the Academic Requirements, along with the Academic Regulations of the Batch into which she gets readmitted.

8.11 A student who is eligible to appear for the End Semester Examination in any Subject/ Course, but is absent for a particular subject/course or has failed (thereby failing to secure C Grade or above), may reappear for that Subject/ Course at the supplementary examination (SEE) as and when conducted. In such cases, her Internal Marks (CIE) assessed earlier for that Subject/Course shall be retained and carried over, and added to the marks to be obtained in the SEE supplementary examination for evaluating her performance in that Subject.

8.12 In view of AICTE/UGC suggestions and guidelines, it is resolved to recommend the inclusion of **"INTERNSHIP" for B.Tech Programme students**, in the 8th Semester (4th Year 2nd Semester), for One Semester Duration, in addition to the B.Tech. Project requirements already specified, with the following notes …

i. The internship will be "Industry Internship", and is exclusively meant for all those students who have been considered eligible and selected accordingly by the Industry. Based on such selection letters from the Industry, approvals will be given to individual students by the Head of Department and the Principal of the Institution to carry out the Industry Internship for One Semester. The Internship Performance will be evaluated by the Supervisor/Advisor/Guide from the Industry for 100 marks (there will not be any Internals/Sessionals from the department side), and a Certificate is to be issued to that effect from the Industry. The Internship will carry a weightage of 3 Credits, and all students who undergo Internship Programme are exempted from the prescribed Open Elective Course of B.Tech.– 4th Year 2nd Semester (which is also for 3 Credits).

ii. If any student fails to complete this Internship Programme due to any reason whatsoever, or fails to secure at least 50% marks in their Internship Performance Evaluation, she would have to register for the previously exempted Open Elective Course of 4th Year 2nd Semester, in the next subsequent semester(s), as a 'supplementary candidate', and complete all the academic requirements as needed.

iii. Because of the mandatory physical presence of the student required at the Industry during the Internship Period, provision is made to the effect that *students may be permitted to choose ONE ON-LINE Course (of NPTEL/MOOCS level - for 3 Credit Weightage),* ***in place of the existing Professional Elective Course (Professional Elective – 6) in 4th Year 2nd Semester of the B.Tech Programme, preferably in the same domain specialization, subject to acceptance and approval by the Head of Department, during 3rd year – 2nd semester or 4th year- 1st semester, as applicable .*** In such cases, the student's performance evaluation will be as per the ON-LINE Course evaluation format. **If any student fails to get the required Grade/Marks in her ON-LINE Course evaluations, she would have to repeat the same ON-LINE Course again (as and when offered) and complete it successfully, or can register for *Professional Elective – 6 in 4th Year 2nd Semester*** to meet all the academic requirements.

9.0 Evaluation - Distribution and Weightage of Marks

9.1 The performance of a student in each semester shall be evaluated Subject-wise (irrespective of the Credits assigned) with a maximum of 100 marks for Theory, or Labs/ Practicals, or Drawing/Design, or Elective Course, or Seminar, or Mini-Project, or Project – I, or Project – II etc. These evaluations shall be based on 30% CIE (Continuous Internal Evaluation) and 70% SEE (Semester End Examination), and a Letter Grade corresponding to the % of marks obtained shall be given.

9.2 For all the Subjects/ Courses as mentioned under **9.1**, the distribution shall be: 30 Marks for the CIE and 70 Marks for the SEE for the entire UG Degree Course.

9.3 **a)** For the Theory Subjects during the semester, there shall be 2 mid-term examinations for 25 marks each. Each mid-term examination consists of one Objective section for 10 marks, plus one Subjective section for 15 marks, with a total duration of 120 minutes. Further, there shall be an allocation of 5 marks for the Assignment, and there shall be 2 Assignments. The Objective section may be set with multiple choice questions, True/False selections, fill-in the blanks, matching type questions, etc. The Subjective section shall contain 5 questions, out of which the student has to answer any 3 questions, each question carrying 5 marks.

b) The first mid-term examination shall be conducted in the middle of the semester for the first 50% of the syllabus, and the second mid-term examination shall be conducted at the end of the semester for the remaining 50% of the syllabus.

c) The First Assignment should be submitted before the conduct of the first mid-term examination, and the Second Assignment should be submitted before the conduct of the second mid-term examination. The Assignments shall be as specified by the subject teacher concerned.

d) The first mid-term examination marks and the first Assignment Marks combined together shall make one set of CIE marks, and the second mid-term examination marks and the second Assignment Marks shall make the second set of CIE marks; and the AVERAGE of the two sets of mid examination marks shall be taken as the final marks secured by the student towards Continuous Internal Evaluation (CIE) in that Theory Subject.

9.4 For the Lab/Practical Subjects, the Continuous Internal Evaluation (CIE) during the semester shall be for 30 Marks, and the End Semester Examination (SEE) shall be for 70 Marks. Out of the 30 Marks for internals (CIE), day-to-day assessment of the lab work shall be assessed for 20 Marks; and one internal lab exam shall be conducted by the laboratory teacher concerned for 10 Marks. The Semester End Examination (SEE) for Lab/Practicals shall be conducted at the end of the semester by Two Examiners nominated by the Head of the Department and approved by the Principal.

9.5 For the Subjects with Design and/or Drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing, Production Drawing Practice, and Estimation etc.), the distribution shall be: 30 Marks for CIE (20 Marks for the day-to-day work and 10 Marks for the internal tests) and 70 Marks for SEE. There shall be TWO internal tests in a semester and the AVERAGE of the two shall be taken into consideration for the award of Marks for the internal tests (CIE).

9.6 **Open Electives**: 4 Open Elective Courses shall be offered in the 8 Semester UG Degree Course. Students are to choose ONE from each set of Open Electives given. However, students cannot opt for an Open Elective Subject offered by their own (parent) Department, if it has been already listed (or the contents included) under any category of the Subjects offered by the parent department in any semester.

9.7 There shall be a Seminar Presentation in the III Year II Semester. For the Seminar, the student shall collect the information on a technical topic, prepare a Technical Report and submit the Technical Report prepared to the Department at the time of Seminar Presentation. The Seminar Presentation (along with the Technical Report submitted) shall be evaluated for 100 marks by Two Faculty Members assigned by the Head of the Department. There shall be no SEE or external examination for the Seminar.

9.8 **a)** There shall be a Mini-Project, preferably in collaboration with an Industry with the relevant specialization, to be registered immediately after III Year II Semester examinations, and taken up during the summer vacation (between III and IV Years) for about eight weeks duration.

b) The Mini-Project work shall be submitted in a Report form, and a presentation of the same shall be made before a Committee and is evaluated for 100 Marks by the committee. The Committee shall consist of the Head of the Department, the supervisor of Mini-Project,

and a Senior Faculty Member of the Department. There shall be no internal marks for Mini-Project. Performance evaluation of the Mini-Project shall be included in the IV Year I Semester Grade Card.

9.9 Each student shall start the Project Work during the IV Year I Semester as per the instructions of the Project Guide/ Project Supervisor assigned by the Head of the Department.

a) The Project Work shall be divided and carried out in 2 phases : Phase – I (Project-I) during IV Year I Semester, and Phase – II (Project-II) during IV Year II Semester, and the student has to prepare two independent Project Work Reports – *one each during each phase*. First Report shall include the Project Work carried out under Phase – I, and the Second Report (Final Report) shall include the Project Work carried out under Phase – I and Phase – II put together. Phase – I and Phase – II of the Project Work shall be evaluated for 100 marks each.

b) Out of the total 100 marks allotted for each Phase of the Project Work, 30 marks shall be for the CIE (Continuous Internal Evaluation/CIE), and 70 Marks shall be for the End Semester Viva-voce Examination/SEE). The Marks earned under CIE for both Phases of the Project shall be awarded by the Project Guide/Supervisor (based on the continuous evaluation of student's performance during the two Project Work Phases/periods); and the marks earned under SEE shall be awarded by the Project Viva-voce Committee/ Board (based on the work carried out, report prepared and the presentation made by the student at the time of Viva-voce Examination).

c) For the Project Phase - I, the Viva-voce shall be conducted at the end of the IV Year I Semester, before the commencement of that Semester End Examinations, at the Department Level by a Committee comprising of the HOD or One Professor and Supervisor (no external examiner), and the Project Phase – II (or Final Project Viva-voce) shall be conducted by a Committee comprising of an External Examiner, the Head of the Department and the Project Supervisor at the end of the IV Year II Semester, before the the commencement of semester and examinations. The nomination of the External Examiner shall be done by the Principal from the panel of 3 names of external faculty members (Professors or Associate Professors outside the College) submitted by the HOD.

9.10 For NCC/ NSS/ NSO Mandatory Courses and/or any other Mandatory Non-Credit Course offered in a semester, a 'Satisfactory Participation Certificate' shall be issued to the student from the authorities concerned, only after securing ≥ 75% attendance in the Course. No Marks or Letter Grade shall be allotted for the Mandatory Courses.

10.0 Grading Procedure

10.1 Marks shall be awarded to indicate the performance of each student in each Theory Subject, or Lab/Practicals, or Workshop/Drawing, or Elective Course, or Seminar, or Project, or Mini-Project, etc., and, based on the % of marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified under 9.0, a corresponding Letter Grade shall be given

10.2 As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed:

% of Marks Secured (Class Intervals)	*Letter Grade (UGC Guidelines)*	*Grade Points*
90% and above (≥ 90% ,≤ 100%)	**O (Outstanding)**	**10**
Below 90% but not less than 80% (≥ 80% ,< 90%)	**A^+ (Excellent)**	**9**
Below 80% but not less than 70% (≥ 70% ,< 80%)	**A (Very Good)**	**8**
Below 70% but not less than 60% (≥ 60% ,< 70%)	**B^+ (Good)**	**7**
Below 60% but not less than 50% (≥ 50% ,< 60%)	**B (above Average)**	**6**
Below 50% but not less than 40% (≥ 40% ,< 50%)	**C (Pass)**	**5**
Below 40% (< 40%)	**F (FAIL)**	**0**

10.3 A student obtaining **'F'** Grade in any Subject shall be considered 'FAILED' and will be required to reappear as 'Supplementary Candidate' in the End Semester Examination (SEE), as and when conducted. In such cases, her Internal Marks (CIE Marks) in those Subject(s) will remain the same as those obtained earlier.

10.4 A Letter Grade does not imply any specific % of marks.

10.5 In general, a student shall not be permitted to repeat any Subject/ Course (s) for the sake of 'Grade Improvement' or 'SGPA/ CGPA Improvement'. However, she has to repeat all the Subjects/Courses pertaining to that semester, when she is detained (as listed under Clauses 8.9- 8.10).

10.6 A student earns Grade Points (GP) in each Subject/ Course on the basis of the Letter Grade obtained by her in that Subject/Course (excluding Mandatory non-credit Courses). Then the corresponding 'Credit Points' (CP) are computed by multiplying the Grade Point with Credits for that particular Subject/Course.

Credit Points (CP) = Grade Points (GP) * Credits for a Course

10.7 The student passes the Subject/ Course only when she gets GP ≥ 5 (C Grade or above).

10.8 The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (ΣCP) secured from ALL Subjects/ Courses registered in a semester by the Total Number of Credits registered during that semester. SGPA is rounded off to TWO Decimal Places. SGPA is thus computed as

SGPA $= \{\sum_{i=1}^{N} C_i G_i\} / \{\sum_{i=1}^{N} C_i\}$ **…. for each Semester**

where 'i' is the Subject indicator index (takes into account all Subjects in a semester), 'N' is the no. of Subjects 'REGISTERED' for the semester (as specifically required and listed under the Course Structure of the parent Department), C_i is the no.

of Credits allotted to the ith Subject, and G_i represents the Grade Points (GP) corresponding to the Letter Grade awarded for that ith Subject.

10.9 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all the semesters considered for registration. The CGPA is the ratio of the Total Credit Points secured by a student in ALL the registered Courses in ALL the semesters, and the Total Number of Credits registered in ALL the semesters. CGPA is rounded off to TWO Decimal Places. CGPA is thus computed from the I Year Second Semester onwards at the end of each semester as per the formula

$CGPA=\{\sum_{j=1}^{M} C_j G_j\}/\{\sum_{j=1}^{M} C_j\}$…for all S semesters registered (ie., up to and inclusive of S semesters, $S \geq 2$),

where 'M' is the TOTAL no. of Subjects (as specifically required and listed under the Course Structure of the parent Department) the student has 'REGISTERED' from the 1st Semester onwards upto and inclusive of the semester S (obviously M > N), 'j' is the Subject indicator index (takes into account all Subjects from 1 to S semesters), C_j is the no. of Credits allotted to the jth Subject, and G_j represents the Grade Points (GP) corresponding to the Letter Grade awarded for that jth Subject. After the registration and completion of I Year I Semester however, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

10.10 For the Merit Ranking or Comparison Purposes or any other listing, ONLY the 'ROUNDED OFF' values of the CGPAs shall be used.

10.11 For Calculations listed under Clauses 10.6 – 10.10, performance in failed Subjects/ Courses (securing F Grade) shall also be taken into account, and the Credits of such Subjects/ Courses shall also be included in the multiplications and summations. However, Mandatory Courses will not be taken into consideration.

10.12 Passing Standards

10.12.1 A student shall be declared successful or 'passed' in a semester, only when she gets a SGPA ≥ 5.00 (at the end of that particular semester); and a student shall be declared successful or 'passed' in the entire UG Degree Course, only when she gets a CGPA ≥ 5.00; subject to the condition that she secures a GP ≥ 5 (C Grade or above) in every registered Subject/ Course in each semester (during the entire UG Degree Course) for the Award of the Degree, as required.

10.12.2A student shall be declared successful or 'passed' in any Non-Credit Subject/ Course, if she secures a 'Satisfactory Participation Certificate' for that Mandatory Course.

10.13 After the completion of each semester, a Grade Card or Grade Sheet (or Transcript) shall be issued to all the Registered Students of that semester indicating the Letter Grades and the Credits earned. The Grade Card or the Grade Sheet shall show the details of the Courses Registered (Course Code, Title, No. of Credits, Grade Earned etc.), Credits earned, SGPA, and CGPA.

11.0 Declaration of Results

11.1 Computation of SGPA and CGPA are done using the procedure listed under Clauses 10.6 – 10.10.

11.2 CGPA is NOT indicative of the % of marks secured. However, in case if % of marks equivalent to the FINAL CGPA (computed at the end of UG Degree Course) is required, then the following formula may be used as an estimate:

% of Marks = (final CGPA – 0.5) x 10

12.0 Award of Degree

12.1 A student who registers for all the specified Subjects/ Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes all the examinations prescribed in the entire UG Degree Course, and secures the required number of 160 Credits (with CGPA ≥ 5.0), within 8 Academic Years from the Date of Commencement of the First Academic Year, shall be declared to have 'QUALIFIED' for the Award of the B.Tech. Degree in the chosen Branch of Engineering as selected at the time of Admission.

12.2 A student who qualifies for the Award of the Degree as listed under Clause 12.1, shall be placed in the following four Classes :

12.2.1 a) A student with final CGPA (at the end of the UG Degree Course) ≥ 8.00, and fulfilling the following conditions -

(i) should have passed all the Subjects/Courses in 'FIRST APPEARANCE' within the first 4 Academic Years (or 8 Sequential Semesters) from the Date of Commencement of her First Academic Year,

(ii) should have secured a CGPA ≥ 8.00, at the end of each of the 8 sequential semesters, starting from the I Year I Semester onwards,

(iii)should not have been detained or prevented from writing the End Semester Examinations in any semester due to shortage of attendance or any other reason,

SHALL be placed in 'FIRST CLASS with DISTINCTION'.

b) A student with final CGPA (at the end of UG Degree Course) ≥ 8.00, but not fulfilling the above conditions, shall be placed in 'FIRST CLASS'.

12.2.2 A student with final CGPA (at the end of the UG Degree Course) ≥ 6.50 but <8.00, shall be placed in 'FIRST CLASS'.

12.2.3 A student with final CGPA (at the end of the UG Degree Course) ≥ 5.50 but <6.50, shall be placed in 'SECOND CLASS'.

12.2.4 All other students who qualify for the Award of the Degree (as per the Clause 12.1), with final CGPA (at the end of the UG Degree Course) ≥ 5.00 but < 5.50, shall be placed in 'PASS CLASS'.

12.2.5 A student with final CGPA (at the end of the UG Degree Course) < 5.00 will not be eligible for the Award of the Degree.

12.2.6 A student fulfilling the conditions listed under the Clause 12.2.1 (a) alone will be the eligible candidate for the 'University/College Rank' and/or 'Gold Medal' considerations.

13.0 Withholding of Results

13.1 If the student has not paid fees to the University/ College at any stage, or has pending dues against her name due to any reason whatsoever, or if any case of indiscipline is pending against her, the result of the student may be withheld, and she shall not be

allowed to go into the next higher semester. The award or issue of the Degree may also be withheld in such cases.

14.0 Transitory Regulations

14.1 A student who has discontinued for any reason, or has been detained for want of attendance or lack of required credits as specified, or who has failed in her B.Tech. Degree Course after the UGDC period of 4 years, may be considered eligible for readmission to the same Subjects/ Courses (or equivalent Subjects/ Courses, as the case may be), and/ or to the same Professional Electives/ Open Electives (from the same set/category of Electives available or equivalents suggested, as the case may be) as and when she is offered (within the time-frame of 8 years from the Date of Commencement of her I Year I Semester), along with the Academic Regulations of the Batch into which she gets readmitted.

15.0 Student Transfers

15.1 There shall be no Branch transfers after the completion of the Admission Process.

16.0 Scope

i) Where the words "Subject" or "Subjects", occur in these regulations, they also imply "Course" or "Courses".

ii) The Academic Regulations 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 Principal is final.

iv) The College may change or amend the Academic Regulations, Course Structure or Syllabi at any time, and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the College Authorities.

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G. NARAYANAMMA INSTITUTE OF TECHNOLOGY & SCIENCE (For Women) (AUTONOMOUS)

Shaikpet, Hyderabad– 500104

ACADEMIC REGULATIONS

For CBCS Based B.Tech. Degree Courses for Students Admitted under Lateral Entry Scheme (LES)

(Effective for the students admitted into II year from the Academic Year **2021-22** and onwards)

A) Eligibility for Admission

A.1 The Admission to the B.Tech. Programme (UG Degree Course) shall be made either on the basis of the merit rank obtained by the qualifying candidate at an Entrance Test conducted by the Telangana State Government (TSECET), OR the University, OR on the basis of any other order of merit approved by the University, subject to the reservations as prescribed by the Government from time to time.

B) B.Tech. Degree Course Structure for LES Students ~

B.1 Regular Full Time B.Tech. Degree Courses at GNITS are of Semester Pattern, with 8 Semesters constituting 4 Academic Years and each Academic Year is of TWO Semesters (First/Odd and Second/Even Semesters). Students admitted under LES shall join - the II Year stream of the Regular B.Tech. students in the relevant branch of engineering (Admitted for 4 Year UG Degree Course in the previous year) and their UG Degree Course period therefore shall be 3 Years (II, III and IV Years) or 6 Semesters of the Regular Full Time B.Tech. Programme (commencing from II Year I Semester).

B.2 The LES Students, after securing admission, shall pursue their UG Degree course of study for not less than 3 years and not more than 6 years, from the year of admission.

B.3 Each student shall Register for and secure the specified number of Credits (122 Credits) required for the completion of the UGDC and the Award of the B.Tech. Degree in the respective Branch of Engineering.

C) Academic Requirements ~

C.1 A student will not be promoted from the II Year to the III Year, unless she fulfills the Attendance and Academic Requirements and secures a total of 24 Credits out of 41 Credits specified up to and inclusive of the II Year II Semester, from all the relevant regular and supplementary examinations, whether she takes those examinations or not.

C.2 A student will not be promoted from the III Year to the IV Year, unless she fulfils the Attendance and Academic Requirements and secures a total of 48 Credits out of 81 Credits specified up to and inclusive of the III Year II Semester, from all the relevant regular and supplementary examinations, whether she takes those examinations or not.

C.3 A student shall register for all the Subjects covering 122 Credits as specified and listed (with the relevant Course/ Subject Classifications as mentioned) in the Course Structure, puts up all the Attendance and Academic requirements for 122 Credits securing a minimum of **'C'** Grade (Pass Grade) or above in each Subject, and earns ALL 122 Credits securing SGPA ≥ 5.0 (in each semester), and ≥ 5.0 CGPA (at the

end of each successive semester), to successfully complete the B.Tech. Degree Course.

C.4 A student who fails to earn 122 Credits specified as per the Course Structure, and as indicated above, within 6 Academic Years from the year of admission (that corresponds to the II Year I Semester of the Regular Full Time B.Tech. Degree Course), shall forfeit their seat in B.Tech. Programme and their admission shall stand cancelled.

D) Award of Degree

D.1 A student who registers for all the specified Subjects/ Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes all the examinations prescribed in the entire UG Degree Course, and secures the required number of 122 Credits (with CGPA ≥ 5.0), within 6 Academic Years from the year of admission, shall be declared to have 'QUALIFIED' for the Award of the B.Tech. Degree in the chosen Branch of Engineering as selected at the time of Admission.

D.2 A student who qualifies for the Award of the Degree as listed under Clause **D.1**, shall be placed in the following Classes :

D.2.1 a) A student with final CGPA (at the end of the UG Degree Course) ≥ 8.00, and fulfilling the following conditions -

(i) should have passed all the Subjects/Courses in 'FIRST APPEARANCE' within the first 3 Academic Years (or 6 Sequential Semesters) from the year of admission,

(ii) should have secured a CGPA ≥ 8.00, at the end of each of the 6 sequential semesters, starting from the II Year I Semester onwards,

(iii)should not have been detained or prevented from writing the End Semester Examinations in any semester due to shortage of attendance or any other reason, SHALL be placed in 'FIRST CLASS with DISTINCTION'.

b) A student with final CGPA (at the end of UG Degree Course) ≥ 8.00, but not fulfilling the above conditions, shall be placed in 'FIRST CLASS'.

D.2.2 A student fulfilling the conditions listed under the Clause D.2.1 (a) alone will be the eligible candidate for the 'University/College Rank' and/or 'Gold Medal' considerations.

D.2.3 All other clauses (and the corresponding CGPAs) shall be same as those listed under clauses 12.2.2 to 12.2.5

E) Other Regulations

All the Academic Regulations as applicable for the B.Tech. 4 Year Degree Course students shall hold good for the B.Tech. Lateral Entry Scheme students also, but for the variations as described above, under Clauses A, B, C and D for LES students.

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MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

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

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

	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.	
7	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall .	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all end examinations. The continuation of the course by the student 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 student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/ year. The student is also debarred and forfeits the seat
9	If student of the college, who is not a student for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to police and, a police case will be registered against them.

10	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the student has appeared 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 Principal for further action to award suitable punishment.	

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G. NARAYANAMMA INSTITUTE OF TECHNOLOGY & SCIENCE
(AUTONOMOUS) (For Women)
Shaikpet, HYDERABAD - 500 104

B.Tech. 4 Year (8 semesters) Regular Programme in Computer Science and Engineering (Artificial Intelligence & Machine Learning)

COURSE STRUCTURE

(Applicable for the Batch admitted from the Academic Year 2020-21 onwards)

I YEAR **I SEMESTER**

S. No.	Group	Course Code	Subject	L	T	P	Credits
1	BS	BS121AA	Chemistry	3	1	-	4
2	BS	BS121AB	Linear Algebra and Multivariable Calculus	3	1	-	4
3	ES	ES121AD	Basic Electrical Engineering	3	1	-	4
4	ES	ES121AF	Programming for Problem Solving	3	-	-	3
5	BS	BS12101	Chemistry Lab	-	-	2	1
6	ES	ES12103	Basic Electrical Engineering Lab	-	-	3	1.5
7	ES	ES12105	Programming Lab	-	-	3	1.5
8	MC	MC12106	Games and Sports	2	-	-	-
			TOTAL	**14**	**3**	**8**	**19**

I YEAR **II SEMESTER**

S. No.	Group	Course Code	Subject	L	T	P	Credits
1	BS	BS122AC	Physics	3	1	-	4
2	BS	BS122AG	Numerical Techniques and Transform Calculus	3	1	-	4
3	HS	HS122AJ	English	2	-	-	2
4	ES	ES122AE	Engineering Graphics	1	-	3	2.5
5	BS	BS12208	Physics Lab	-	-	3	1.5
6	HS	HS12212	English Professional and Communication Skills Lab	-	-	2	1
7	ES	ES12210	Computational Mathematics Lab	-	-	3	1.5
8	ES	ES12211	Engineering Workshop	1	-	3	2.5
9	MC	MC12213	National Service Scheme (NSS)	2	-	-	-
			TOTAL	**12**	**2**	**14**	**19**

Games & Sports / NSS: Participation Certificate is Mandatory for each semester

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COURSE STRUCTURE

II YEAR **I SEMESTER**

S.No.	Group	Course Code	Subject	L	T	P	Credits
1	BS	BS123AL	Probability and Statistics	3	-	-	3
2	BS	BS123AZ	Discrete Mathematics	3	-	-	3
3	ES	ES123AN	Digital Logic Design	3	-	-	3
4	PC	PC123NA	Data Structures Using C	3	1	-	4
5	PC	PC123BJ	Database Management Systems	3	-	-	3
6	ES	ES12370	IT Workshop and Python Programming Lab	-	-	3	1.5
7	PC	PC12372	Data Structures Using C Lab	-	-	3	1.5
8	PC	PC12328	Database Management Systems Lab	-	-	3	1.5
9	MC	MC12317	Gender Sensitization	2	-	-	-
			TOTAL	**17**	**1**	**9**	**20.5**

II YEAR **II SEMESTER**

S.No.	Group	Course Code	Subject	L	T	P	Credits
1	HS	HS124BD	Managerial Economics and Financial Analysis	3	-	-	3
2	PC	PC124BH	Computer Organization and Architecture	3	-	-	3
3	PC	PC124BN	Operating Systems	3	-	-	3
4	PC	PC124AX	Object Oriented Programming	3	1	-	4
5	PC	PC124NB	Introduction to Artificial Intelligence	3	-	-	3
6	PC	PC12427	Computer Organization and Microprocessor Lab	-	-	3	1.5
7	PC	PC12433	Operating Systems Lab	-	-	3	1.5
8	PC	PC12423	Object Oriented Programming through Java Lab	-	-	3	1.5
9	MC	MC124BE	Environmental Sciences	2	-	-	-
			TOTAL	**17**	**1**	**9**	**20.5**

G. NARAYANAMMA INSTITUTE OF TECHNOLOGY & SCIENCE
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	L	T	P	C
I Year B.Tech. CSE (AI&ML) I-Semester				
Course Code: BS121AA	**3**	**1**	**-**	**4**

CHEMISTRY
(Common to CSM & CSD)

Prerequisites: -Nil-

Course Objectives:

1. To bring adaptability to new developments in engineering chemistry and to acquire the skills required to become a perfect engineer.
2. To include the importance of water in industrial usage, significance of corrosion control to protect the structures.
3. To acquire the knowledge of reaction mechanisms involved in various organic reactions.

UNIT 1: (~ 8 Lecture Hours)
Molecular Structure and Theories of Bonding: Atomic and molecular orbitals: Linear combination of atomic orbitals (LCAO), molecular orbitals of diatomic molecules. Molecular orbital energy level diagrams of diatomic molecules, N_2, O_2 and F_2. ∏ Molecular orbital diagrams of butadiene, benzene and aromaticity.
Crystal Field Theory (CFT): Salient Features of CFT: Crystal field splitting patterns of transition metalion d-orbitals in tetrahedral, octahedral and square planar complexes. Magnetic properties: Spin only magnetic moments of transition metals of d^2-d^9 configuration in octahedral complexes. Band structure of solids and effect of doping on conductance.

UNIT 2: (~ 12 Lecture Hours)
Electrochemistry and Corrosion: Electrochemistry: Conductance: Specific, equivalent and molar conductance and their interrelationship and numerical problems. Electrochemical cell: Electrode potential, standard electrode potential and emf of the cell. Nernst equation, its derivation and applications. Types of electrodes: Standard hydrogen electrode, calomel electrode and glass electrode. Electro chemical series and its applications. Concept of concentration cells: Electrolytic concentration cell and numerical problems. Batteries: Lead acid storage battery and lithium ion battery.
Corrosion: Causes and effects of Corrosion: Theories of chemical and electrochemical corrosion. Mechanism of electrochemical corrosion. Types of corrosion: Galvanic, waterline and pitting corrosion. Factors affecting rate of corrosion. Corrosion control methods: Cathodic protection-Sacrificial anode and impressed current cathodic methods. Surface coatings: Metallic coatings –hot dipping: galvanizing and tinning. Electroplating: Copper plating and electroless plating - Nickel plating.

UNIT 3: (~ 8 Lecture Hours)
Periodic Properties and Nanomaterials: Periodic table: Electronic configurations, atomic and ionic sizes, ionizationenergies, electronaffinity and electronegativity. Variations of s,p,d,f orbital energies of atoms in periodic table. Co-ordination numbers and geometries. Hard and soft acids and bases. HSAB rule and its applications.
Nanomaterials: Synthesis: Top down and bottom up approaches. Properties and applications of fullerenes, carbon nanotubes. General applications of nanomaterials.

UNIT 4: (~ 8 Lecture Hours)
Water and its treatment: Hardness of water: Causes of hardness and types of hardness - temporary and permanent. Expression and units of hardness. Estimation of hardness of water by complexometric method and numerical problems. Potable water and its specifications. Steps involved in treatment of potable water: Disinfection of potable water by chlorination and ozonisation. Boiler troubles: Scales, sludges, priming, foaming and caustic embrittlement. Boiler feed water: Internal treatment by calgon, phosphate and colloidal conditioning and external treatment of Water by Ion exchange process. Desalination of water: Reverse osmosis. Sewage and its treatment: primary, secondary and tertiary treatments.

UNIT 5: (~ 11 Lecture Hours)
Stereochemistry, Reaction Mechanism and Synthesis of Drug Molecules: Representation of 3 -Dimensional structures: Structural and stereo isomers, configurations. Chirality, enantiomers, diastereomers, optical activity and absolute configuration. Conformation analysis of n- butane. Isomerism in transition metal complexes.
Substitution reactions: Nucleophilic substitution reactions, mechanism of SN^1 and SN^2 reactions. Addition reaction: Electrophilic and Nucleophilic addition. Addition of HBr to Propene: Markownikoff and anti Markownikoff additions. Grignard reactions on carbonyl compounds. Elimination reactions: Dehydrohalogenation of alkyl halides - Saytzeff rule. Oxidation reactions: Oxidation of alcohols using $KMnO_4$ and Chromic acid. Reduction reactions: Reduction of carbonyl compounds using $LiAlH_4$ and $NaBH_4$. Synthesis of Drug molecules: Paracetamol and aspirin.

Text Books:

1. P.C Jain and Jain Monika, Engineering Chemistry, 16th Edition, DhanpatRai Publication Company.
2. Morison and Boyd, Organic Chemistry, 7th Edition, Pearson publications.
3. B.Rama Devi, Ch. VenkataRamana Reddy and PrasanthRath, Text Book of Engineering Chemistry, Cengage Learning.

Reference Books:

1. B.H.Mahan University Chemistry, Addison –Wesley Publishing Company.
2. M.J.Sienko and R.A.Plane, Chemistry: Principles and Applications, McGraw Hill International.
3. J.D.Lee, Concise inorganic Chemistry, 5th Edition, Oxford Publication.
4. K.P.CVolhadt and N.E Schore, Organic Chemistry: “Structure and Function”, 7th Edition, Freeman publications.
5. B.R.Puri, L.R.Sharma and Patani, Principles of Physical Chemistry, 6th Edition, McGraw-Hill Publication.

Online Resources:

1. htttp://www.nptelvideos.in/2017/10/engineering chemistry.html.
2. http://www.nptel.ac.in/engineering chemistry courses.

Course Outcomes:

After completion of the course, students will be able to

1. Analyze microscopic chemistry in terms of atomic and molecular orbitals.
2. Students will gain the basic knowledge of electrochemical procedures related to corrosion and its control.
3. Rationalize periodic properties such as ionization potential, electronegativity and oxidation states.
4. Students can develop and apply the concepts to identify the hardness and boiler troubles of water.
5. List major chemical reactions that are used in the synthesis of drugs.
6. Students can develop and apply the concepts for the solutions of complex engineering problems.

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	L	T	P	C
I Year B.Tech. CSE (AI&ML) I-Semester				
Course Code: BS121AB	**3**	**1**	**-**	**4**

LINEAR ALGEBRA AND MULTI VARIABLE CALCULUS
(Common to CST, CSM & CSD)

Prerequisites: -Nil-

Course Objectives:
1. To learn the concepts of rank of a matrix and applying it to understand the consistency of system of equations.
2. To solve system of linear equations.
3. To study properties of Eigen values and Eigen vectors.
4. To find extreme values for functions of several variables.
5. To find the solutions of first, higher order ODE.
6. To evaluate the double and triple integrals for functions of several variables.

UNIT1: (~ 8 Lecture Hours)
Linear System of Equations - Types of real matrices and complex matrices, rank, echelon form, normal form, consistency and solution of linear systems (homogeneous and Non-homogeneous), LU decomposition method.

UNIT 2: (~ 8 Lecture Hours)
Eigen values and Eigen Vectors - Eigen values, Eigen vectors and their properties. Cayley - Hamilton theorem (without proof), Inverse and powers of a matrix using Cayley - Hamilton theorem, Diagonalization.

UNIT 3: (~ 12 Lecture Hours)
Differential Equations – Linear, Bernoulli's, Exact Differential Equations, Differential Equations Reducible to exact, Orthogonal trajectories.
Linear differential equations of higher order with constant coefficients: Non-homogeneous differential equations with RHS term of the type $e^{ax}, sinax, cosax$, polynomials in x, $e^{ax}V(x), xV(x)$, Method of variation of parameters, Applications to Electrical circuits.

UNIT 4: (~ 10 Lecture Hours)
Functions of Several Variables – Limit & Continuity (Definitions), Partial derivatives, Chain rules, total derivative, differentiation of implicit functions, Jacobian, functional dependency. Maxima and minima of functions of two variables (with and without constraints) and Lagrange's method of undetermined multipliers.

UNIT 5: (~ 10 Lecture Hours)
Multiple Integrals - Double and triple integrals, change of variables, Change of order of integration.
Applications: Finding areas as double integral and volumes as triple integrals.

Text Books:

1. Dr. B. S. Grewal, Higher Engineering Mathematics, 45th Edition, Khanna Publishers.
2. N. P. Bali, Engineering Mathematics, 1st Edition, Lakshmi Publications.

Reference Books:

1. B.V.Ramana, Higher Engineering Mathematics, 1st Edition, Tata McGraw-Hill Publications.
2. E.Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley and Sons Publisher.
3. Srimanta Pal, SubodhC.Bhunia, Engineering Mathematics, 1st Edition, Oxford Higher Education.

Online Resources:

1. http://www.nptelvideos.in/2012/11/mathematics.html
2. http://nptel.ac.in/courses/111106051/

Course Outcomes:

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

1. Solve and analyze the solution for the system of equations.
2. Compute the Eigen values and Eigen vectors which come across under linear transformations.
3. Determine the extreme values of functions of two variables with/ without constraints.
4. Find the solutions of ordinary differential equations.
5. Evaluate double and triple integrals.
6. Apply the knowledge of mathematics for real situations.

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	L	T	P	C
I Year B.Tech. CSE (AI&ML) I-Semester				
Course Code: ES121AD	**3**	**1**	**-**	**4**

BASIC ELECTRICAL ENGINEERING
(Common to CSM & CSD)

Prerequisites: -Nil-

Course Objectives:
1. To introduce the concepts of Basic Electrical parameters.
2. To analyze basic concepts of AC & DC circuits.
3. To carry out operational analysis of Electrical Machines, Transformers and power converters.

UNIT 1: (~ 10 Lecture Hours)
Magnetic Circuits and DC Circuits
Magnetic Circuits: Magnetic circuits - MMF, flux, reluctance, Inductance; B-H curve of magnetic materials; Minimization of Hysteresis and Eddy current losses.
DC Circuits: Electrical Circuit elements: R, L and C, voltage and current sources, Star – Delta Transformation, Kirchoff's laws, Nodal and Mesh analysis of simple circuits with dc excitation, Superposition, Thevenin's and Norton's Theorems with independent sources-Simple Problems.

UNIT 2: (~ 8 Lecture Hours)
AC Circuits
1-Ø *AC Circuits:* Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor; Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations, series and parallel resonance.
3-Ø *AC Circuits:* Three phase balanced circuits, voltage and current relations in star and delta connections – Simple Problems.

UNIT 3: (~ 10 Lecture Hours)
DC Machines and Transformers
Basic Concepts: Faraday's laws of Electromagnetic induction – statically & dynamically induced emf-Lenz's law – Fleming's Right hand rule.
DC Machines: Principle of operation – Construction - working; Types of DC machines-EMF and Torque equation; Torque-Speed characteristics and speed control of separately excited DCMotor - Numerical problems.
Transformers: Ideal and practical transformer, EMF equation, Simple Problems.
Equivalent circuit - losses in transformers, Three phase transformer connections (Descriptive treatment only).

UNIT 4: (~ 9 Lecture Hours)
AC Machines (Descriptive treatment only)
3-Ø Induction motors: Principle of Operation, Construction of a Three-Phase Induction Motor; Production of rotating magnetic field; slip- frequency of rotor emf – starting Torque – Torque under running conditions. Torque - Slip characteristics.
Induction motors: Basic concepts of 1-ØInduction motors: Split-phase Induction Motor;

Synchronous Machines: Principle of Operation of Synchronous Generators.

UNIT 5: (~ 8 Lecture Hours)
Power Converters & Switchgear (Descriptive treatment only)
Basic Concepts: Basic Semiconductor Devices: Diode, Transistor, SCR;
Power Converters*:* DC-DC Buck and Boost Converters; Single Phase Inverters- Half & Full, Bridge Configuration (Elementary treatment only).
Switchgear*:* Introduction to Components of LT (Low Tension) Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB. Types of Wires and Cables, Earthing.

Text Books:
1. T.K.Nagasarkar and M.S.Sukhija, Basic Electrical Engineering, 3rd Edition 2018, Oxford University Press.
2. V.K Mehta, Rohit Mehta, Principles of Electrical Engineering, S.Chand Publications.

Reference Books:
1. D.P.Kothari and I.J.Nagrath, Basic Electrical Engineering, Tata McGraw Hill, 2010.
2. V.DelToro, Electrical Engineering Fundamentals, Prentice Hall India, 1989.
3. D.C.Kulshreshtha, Basic Electrical Engineering, McGraw Hill, 2009.

Course Outcomes:
After completion of this course, students will be able to
1. Analyze the basic circuits with application of Network Reduction Techniques and Network Theorems.
2. Understand and analyze magnetic circuits.
3. Analyze the working principles of electrical machines and power converters.
4. Understand the components of low voltage electrical installations.
5. Apply the above conceptual theories to real world Electrical & Electronic problems and applications.
6. Understand and apply the Knowledge of various types of protective systems in real time.

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	L	T	P	C
I Year B.Tech. CSE (AI&ML) I-Semester				
Course Code: ES121AF	**3**	**-**	**-**	**3**

PROGRAMMING FOR PROBLEM SOLVING
(Common to CST, CSM & CSD)

Prerequisites: -Nil-

Course Objectives:
1. Learn the fundamentals of computers.
2. Understand the various steps in program development.
3. Learn the syntax and semantics of C programming Language.
4. Learn how to write modular and readable C programs.
5. Learn to write programs using structured programming approach in C to solve problems.

UNIT 1: (~ 10 Lecture Hours)
Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Program Development, algorithms and flowcharts , Number systems - Binary, Decimal, Hexadecimal and Conversions. Introduction to C Language – Background, C Programs, Identifiers, Types, Variables, Constants, Input / Output, Operators (Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence and Associativity, Expression Evaluation, Type conversions.
Statements - Selection Statements (making decisions) – if and switch statements.

UNIT 2: (~ 10 Lecture Hours)
Repetition statements (loops) - while, for, do-while statements, Loop examples, other statements related to looping – break, continue.
Arrays – Concepts, using arrays in C, array applications - linear search, binary search and bubble sort, two – dimensional arrays, multidimensional arrays.
Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions.

UNIT 3: (~ 9 Lecture Hours)
Functions - Designing Structured Programs, Functions, user defined functions, inter function communication, Standard functions, Scope, Storage classes - auto, register, static, extern, scope rules, type qualifiers, recursion - recursive functions, Limitations of recursion.
Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, Pointer Applications-Arrays and Pointers, Pointer Arithmetic and arrays, Passing an array to a function, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions.

UNIT 4: (~ 10 Lecture Hours)
Enumerated, Structure and Union Types – The Type Definition (typedef), Enumerated types, Structures – Declaration, initialization, accessing structures, operations on structures, Complex structures - Nested structures, structures containing arrays, structures containing pointers, arrays of structures, structures and functions, Passing structures through pointers, self-referential structures, unions, bit fields.

UNIT 5: (~ 7 Lecture Hours)
Introduction to files, Using files in C, Reading data from files- fscanf(), fgets(), fgetc(), fread(), Writing Data to files - fprintf(), fputs(), fputc(), fwrite(), Detecting the End-of-File, Error Handling functions, Random access to files, Command Line Arguments, preprocessor commands.

Text Books:
1. B.A.Forouzan and R.F.Gilberg,Computer Science: A Structured Programming Approach Using C, 3rd Edition, Cengage learning.
2. Reema Thareja, Introduction to C Programming, 2nd Edition, Oxford University Press.

Reference Books:
1. Byron Gottfried, Schaum's Outline of Programming with C, 2nd Edition, McGraw-Hill.
2. E.Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill.
3. C Programming Language, B.W.Kernighan & Dennis Ritchie, 2nd Edition, PHI.

Online Resources:
1. www.geeksforgeeks.org

Course Outcomes:
After completion of the course, students will be able to
1. Formulate and translate algorithms for arithmetic and logical problems to programs (in C language).
2. Test and execute the programs and correct syntax and logical errors.
3. Implement conditional branching, iteration and recursion.
4. Decompose a problem into functions and synthesize a complete program.
5. Use arrays, pointers and structures to formulate programs.
6. Understand the concepts of files and perform operations on them.

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	L	T	P	C
I Year B.Tech. CSE (AI&ML) I-Semester				
Course Code: BS12101	-	-	2	1

CHEMISTRY LAB

(Common to CSM & CSD)

Prerequisites: -Nil-

Course Objectives:

1. Chemistry Laboratory curriculum gives the students hands on experience about various scientific and technical aspects.
2. Provide the students with a solid foundation in Chemistry laboratory required to solve engineering problems.
3. To provide an overview of preparation of drugs.

LIST OF EXPERIMENTS:

Volumetric Analysis:

1. Estimation of hardness of water by Complexometric method using EDTA.
2. Estimation of Ferrous ion by Permanganometry.
3. Estimation of Ferrous ion by Dichrometry.
4. Estimation of Chloride by Argentometry.

Chemical kinetics:

5. Determination of rate constant of acid catalysed hydrolysis of methyl acetate.

Instrumental methods of Analysis:

6. Estimation of HCl by Conductometry.
7. Estimation of HCl and acetic acid in a given mixture by Conductometry.
8. Estimation of HCl by Potentiometry.
9. Estimation of Ferrous by Potentiometry using Potassium dichromate (redox).
10. Estimation of manganese in $KMnO_4$ by Colorimetry.
11. Determination of Viscosity of coconut oil and castor oil.

Synthesis of Drug molecule:

12. Preparation of Aspirin and Paracetamol.

Text Books:

1. B.D.Khosla, A.Gulati and V. Garg, Senior practical physical chemistry (R.C,and and Co., Delhi).
2. K.K.Sharma and D.S.Sharma, An introduction to practical chemistry (Vikaspublishing,N.Delhi).
3. Y.Bharathikumari and JyotsnaCherukuri, Laboratory manual of engineering chemistry (VGS booklinks).

Reference Books:

1. Vogel's Text book of Quantitative chemical analysis, 5th Edition, 2015.
2. Payal B. Joshi, Experiments in Engineering chemistry, 1st Edition, I.K International Publishing house.

Online Resources:

1. http://www.nptel videos.in engineering chemistry labexperiments.htm

Course Outcomes:

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

1. Expected to learn from this laboratory course the concept of error and its analysis.
2. Demonstrate writing skills and can derive valid conclusions.
3. Compare the experimental results with those introduced in lecture, draw relevant conclusions and substantiate.
4. Learn the ability to prepare advanced polymer materials.
5. Work on time reactions, thereby can get in depth knowledge on chemical kinetics.
6. The course allows the students to develop and design new experimental skills relevant to the course.

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	L	T	P	C
I Year B.Tech. CSE (AI&ML) I-Semester				
Course Code: ES12103	**-**	**-**	**3**	**1.5**

BASIC ELECTRICAL ENGINEERING LAB

(Common to CSM & CSD)

Prerequisites: -Nil-

Course Objectives:

1. To verify the Network Theorems and understand the usage of common electrical measuring instruments.
2. To understand the basic characteristics of transformers and electrical machines.
3. To get an exposure to the working of power electronic converters.

PART-A (Compulsory)

1. A) Basic Safety Precautions.
   B) Study of measuring instruments & elements.
   a) Voltmeters, Ammeters, Wattmeters, Multimeters, CRO.
   b) Resistors, Inductors & Capacitors.
2. Study of Cut – out sections of
   a) DC Machine b) 3-Ø Induction Machine (cage type).
3. Study of Cut – out sections of
   c) Synchronous Machine d) 1-Ø Induction Machine.
4. A) Study of Converters
   a) DC – DC converters.
   b) DC – AC converters.
   B) Study of Components of LT switchgear
   a) SFU b) MCB c) ELCB d) MCCB
5. Series resonance. Determination of Resonant frequency & Bandwidth.
6. Parallel resonance. Determination of Resonant frequency & Bandwidth.
7. Verification of Superposition theorem with DC excitation.
8. Verification of Thevenin's & Norton's theorems with DC excitation.

PART-B (Any Two)

1. Load test on a 1-Ø transformer. Determination of efficiency.
2. Verification of voltage and current relations in a 3-Ø transformer.
3. Measurement of Power in a 3-Ø balanced load.
4. Torque v/s speed characteristics of a separately excited DC motor.
5. Torque-slip characteristics of a 3-Ø Induction Motor.
6. OCC characteristics of a synchronous generator.

Note: All Experiments from PART-A and any Two Experiments from Part –B are to be conducted

Course Outcomes:

After completion of this course, students will be able to

1. Identify & use basic measuring instruments and their usage.
2. Verify different network theorems with dc excitation.
3. Carry out analysis of simple circuits with dc excitation.
4. Analyze bridge rectifiers.
5. Identify power converters.
6. Identify different electrical machines & their characteristics.

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	L	T	P	C
I Year B.Tech. CSE (AI&ML) I-Semester				
Course Code: ES12105	**-**	**-**	**3**	**1.5**

PROGRAMMING LAB
(Common to CST, CSM & CSD)

Prerequisites: -Nil-

Course Objectives:
1. Learn Basic programming concepts.
2. Learn the syntax and semantics of C programming Language.
3. Write programs in C using structured programming approach to solve the problems.

List of Experiments:

Week 1: Familiarization with programming environment.
Introduction to the working environment, Compiling, running and debugging C Programs, Simple C programs.

Week 2: Simple computational problems using arithmetic expressions
a. Write a C program which reads time required (in Hours and Minutes) to complete two tasks and then print the total time in hours and minutes.
b. Write a C program which reads five students marks in a test and then prints average mark of passed students (Assume that a minimum of 35 is needed to pass) using operators.
c. Assume an Object is thrown upwards with some initial velocity, u (in m/sec). Write a C program to find the maximum height which it can reach. Assume acceleration due to gravity is $9.8m^2$ /sec.
Hint: Maximum height, $h=u^2/2g$.

Week 3: Problems involving if-then-else structures and switch statement
a. Write a C program to check whether a given number is even or odd using bitwise operator.
b. Write a C program to find the roots of a quadratic equation.
c. Write a C program to carry out the arithmetic operations addition, subtraction, multiplication, division and modulus using switch statement.

Week 4: Iterative problems
a. Write a C program to find whether a given number is Armstrong or not.
b. Write a C program to determine if the given number is a prime number or not.
c. Write a C program to calculate the following Series:
$Sum=1-x^2/2! +x^4/4!-x^6/6!+x^8/8!-x^{10}/10!$
d. Write a C program to find the number of even and odd digits in a given number.

Week 5: Applications of 1D Array
a. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user using Sieve of Eratosthenes algorithm.
b. Write a C program to search for a Key value in a given list of integers. Use linear search.
c. Write a C program to search for a Key value in a given list of integers. Use binary search.

d. Write a C program to implement Bubble sort method to sort a given list of integers in ascending order.

Week 6: Applications of Strings
a. Write a C program to perform the following:
   i) To insert a sub-string into a main string at a given position.
   ii) To delete n characters from a given position in a string.
b. Write a C program to determine whether the given string is a palindrome or not.
c. Write a C program to replace a substring with another in a given line of text.

Week 7: Applications of 2D arrays and Strings
a. Write a C program that reads two matrices and performs Addition of two matrices.
b. Write a C program that reads two matrices and performs Multiplication of two matrices.
c. Write a C program to Sort Array of Strings.

Week 8: Simple functions
a. The least common multiple (LCM) of two positive integers a and b is the smallest integer that is evenly divisible by both a and b. Write a C program that reads two integers and calls LCM (a, b) function that takes two integer arguments and returns their LCM. The LCM (a, b) function should calculate the least common multiple by calling the GCD (a, b) function and using the following relation: LCM (a, b) = ab / GCD (a, b).
b. Write a function to find the factorial of a positive integer.
c. Write a menu-driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum or average. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.
d. Write a C program that reads two integers and calls a factorial function to compute ${}^{n}C_{r}$ value.

Week 9: Recursive functions
a. Write a C program that reads two integers x and n and calls a recursive function to compute x^n.
b. Write a C program that uses a recursive function to solve the Towers of Hanoi problem.
c. Write a C program that uses a recursive function to generate Pascal's triangle.
d. 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 which calls a recursive function to generate the first n terms of the sequence.

Week 10: Pointers and dynamic memory allocation
a. Write a C program to find the number of times a given word (i.e., a short string) occurs in a sentence.(i.e., a long string).
b. Using pointers, write a function that receives a character string and a character as argument and deletes all occurrences of this character in the string. Function should return the corrected string with no spaces.
c. Write a C program to find the maximum from a set of elements. The number of elements will be decided during the execution of the program.

Week 11: Structures
a. Write a menu-based program in C that uses a set of functions to perform the following Operations:

i) Reading a Complex number ii) Writing a complex number
iii)Addition of two complex numbers iv)Subtraction of two complex numbers
v) Multiplication of two complex numbers
Represent the complex number using a structure.

b. Declare a structure to store the following information of an employee: Employee code, Employee name, Salary, Department number, Date of joining (it is itself a structure consisting of day, month and year). Write a C program to store the data of N employees where N is given by the user (Use dynamic memory allocation). Include a Menu that allows user to select any of the following features:
   i) Use a function to display the employee information who are drawing the maximum and minimum salary.
   ii) Use a function to display the employee records in ascending order according to their date of joining.

Week 12:

a. Write a C program to display the contents of a file to standard output device.
b. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.
c. Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command-line arguments.
d. Write a C program to reverse the first n characters in a file. The file name and n are specified on the command line. Use fseek function.

Text Books:

1. B.A.Forouzan and R.F.Gilberg, Computer Science: A Structured Programming Approach Using C, 3rd Edition, Cengage learning.

Reference Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, 2nd Edition, McGraw-Hill.
2. Yashavant P. Kanetkar, Let Us C, 13th Edition, Bpb Publications.
3. B.W.Kernighan& Dennis Ritchie, C Programming Language, 2nd Edition, PHI.
4. E.Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill.

Online Resources:

1. www.geeksforgeeks.org

Course Outcomes:

After completion of the course, students will be able to

1. Compile, debug and test the program.
2. Apply the knowledge in C to write modular, structured programs in solving real world problems.
3. Design programs to solve mathematical and scientific problems.
4. Write structured programs using control structures and functions.
5. Demonstrate usage of pointers and structures.
6. Solve problems using file concepts.

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	L	T	P	C
I Year B.Tech. CSE (AI&ML) II-Semester				
Course Code: BS122AC	**3**	**1**	**-**	**4**

PHYSICS
(Common to CSM & CSD)

Prerequisites: -Nil-

Course Objectives:

1. To understand the interaction of light with matter through interference and diffraction.
2. To understand the behavior of a particle quantum mechanically.
3. To understand the importance of dielectric and magnetic materials.
4. To analyze the semiconductors and semiconductor devices.
5. To understand the construction and working principle of different types of lasers and light propagation through optical fiber.

UNIT 1: (~ 8 Lecture Hours)
Wave optics: Huygens' Principle, superposition of waves, Interference of light by division of wavefront and amplitude. Young's double slit experiment, Interference from a thin plane glass plate (reflected light), Newton's rings experiment. Types of diffraction, Farunhofer diffraction due to single slit and 'N' slits; Diffraction grating experiment.

UNIT 2: (~ 10 Lecture Hours)
Principles of Quantum mechanics and Band theory of solids: Introduction to Quantum mechanics, Wave particle duality and de-Broglie hypothesis, Davission–Germer experiment; Uncertainty principle, Time-dependent and time independent Schrodinger equation for wave function, Born interpretation; Free-particle wave function, Particle in 1D box (square well potential) energy values, Expectation values vs position in the box.

Density of states and occupation probability; Kronig-Penny model (using Bloch theorem; qualitative), Energy bands in solids, E-k diagram, classification of materials: Metals, Semiconductors and Insulators, Effective mass of an electron.

UNIT 3: (~ 10 Lecture Hours)
Dielectric and magnetic materials : **Dielectric materials**: Electric dipole, Dipole moment, Dielectric constant, Polarizability, Electric susceptibility, Displacement vector, electronic, ionic and orientation polarizations, their polarizabilitity expressions, internal field and Clausius-Mossotti(equations only); Piezoelectricity, pyroelectricity and ferroelectricity and their applications; $BaTiO_3$ structure.
Magnetic materials: Permeability, field intensity, magnetic field induction, magnetization, magnetic susceptibility, origin of magnetic moment, Bohr magneton, classification of dia, para and ferro magnetic materials on the basis of magnetic moment, hysteresis curve based on domain theory, soft and hard magnetic materials, properties of antiferro and ferri magnetic materials,
Superconductivity: Superconductivity phenomenon, Meissner effect, applications of superconductivity.

UNIT 4: (~ 10 Lecture Hours)
Semiconductors: Intrinsic and extrinsic semiconductor carrier concentrations, intrinsic carrier concentration; Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Diffusion and drift phenomenon(Qualitative), Formation of PN junction, open circuit PN junction, energy diagram of PN junction diode, Direct and indirect bandgaps; Hall-effect, Semiconductor materials of interest for optoelectronic devices (LED, Solar cell).

UNIT 5: (~ 10 Lecture Hours)
LASERs and Optical Fibers: **LASERS**: Properties of laser beams: Mono-chromaticity, coherence, directionality and brightness, laser speckles, Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne), solid-state lasers(ruby), Semiconductor Lasers; applications of lasers in science, engineering and medicine.
Fiber Optics: Introduction, light propagation through optical fibre: Total internal reflection, Types of optical fibres: step and graded index fibres, Acceptance angle, Numerical aperture, Attenuation and Bending losses in optical fibres, Applications of optical fibres in Communication, Medicine and as sensors.

Text Books:
1. MN Avadhanulu & PG Kshirsagar, A text book of Engineering Physics, revised Edition of 2014, S Chand.
2. DK Bhattacharya & Poonam Tandon, Engineering Physics, fourth impression 2017, Oxford press.

Reference Books:
1. Eisberg and Resnick, Quantum Physics, 2nd Edition, Wiley.
2. B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., (2007).
3. Material Science by Armugam, Anuradha publications.
4. Physics of the atom by Wehr and Richards. 4th Edition, Narosa.

Online Resources:
1. http://www.cod.edu/people/faculty/cartert/phy2112/slides/Lect29-physical-optics-handout.pdf
2. https://www2.physics.ox.ac.uk/sites/default/files/2012-02-17/optics_lectures_2012_pdf_10837.pdf
3. http://www.iap.uni-jena.de/iapmedia/de/Lecture/Physical+optics1501538400/PO16_Physical+optics+8+Lasers.pdf
4. http://alan.ece.gatech.edu/ECE6451/Lectures/ECE6451L1IntroductionToElectronicMaterials.pdf
5. https://www.colorado.edu/physics/phys3330/phys3330_fa11/Lecture%20notes/semiconductor%20lectures%202011.pdf
6. http://www.seklad69associates.com/seklad69associates.com/EEG_811_files/Semiconductor%20Physics.pdf
7. https://www.youtube.com/watch?v=03j4ZvQCKWY

Course Outcomes:

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

1. Realize the importance of light interaction with matter and its effects of superposition.
2. Understand the quantum mechanical behavior of particles in different field environments.
3. Distinguish materials on the basis of their electric and magnetic behavior and their applications.
4. Estimate the carrier concentration of different types of semiconductors and be able to understand the working of optoelectronic devices.
5. Realize the importance of Lasers in engineering fields.
6. Understand the underlying principles of optical fibers and fiber optics.

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	L	T	P	C
I Year B.Tech. CSE (AI&ML) II-Semester				
Course Code: BS122AG	**3**	**1**	**-**	**4**

NUMERICAL TECHNIQUES AND TRANSFORM CALCULUS
(Common to CST, CSM & CSD)

Prerequisites: -Nil-

Course Objectives:
1. To learn an alternative method for analytical methods in mathematical concepts.
2. To apply numerical techniques in solving ordinary differential equations.
3. To study the properties of vector valued functions and differential operators.
4. To attain the knowledge on integrals of vector valued functions.

UNIT 1: (~ 9 Lecture Hours)
Numerical Solutions of Algebraic and Transcendental Equations: Introduction, Bisection Method, Regula-False method, Iteration method and Newton Raphson method. Solving linear system of equations by Gauss-Jacobi and Gauss-Seidel method.
Curve Fitting: Fitting a linear, second degree, exponential curve by method of least squares for the discrete data.

UNIT 2: (~ 9 Lecture Hours)
Numerical integration: Newton-Cote's Quadrature Formula, Trapezoidal Rule, Simpson's 1/3rd and 3/8th Rule.
Numerical solutions of Ordinary Differential Equations: Solution of ordinary differential equations by Taylor's Series, Picard's method of Successive approximations, Euler's and Modified Euler's methods, Fourth Order Runge-Kutta Method.

UNIT 3: (~ 10 Lecture Hours)
Laplace Transforms - Laplace Transform of Standard functions, First and Second Shifting Theorems, Transforms of derivatives and integrals, Multiplication and Division by 't', Laplace Transform of Periodic Function, Unit Step function, Dirac's Delta function.
Inverse Laplace Transform- Method of Partial Fractions, Convolution theorem (without proof) Applications of Laplace Transforms to Ordinary Differential Equations.

UNIT 4: (~ 10 Lecture Hours)
Vector Differentiation- Scalar and Vector point functions, Gradient, Divergence, Curl and related properties, Unit Normal Vector, Directional Derivatives and Angle between the surfaces, Laplacian operator and Vector identities.

UNIT 5: (~ 10 Lecture Hours)
Vector Integration - Line Integral-Work Done-Potential function, Area, Surface and Volume Integral.
Vector Integral Theorems: Green's theorems, Stoke's theorems and Gauss's divergence theorems (Without Proofs) and their Verification.

Text Books:

1. Dr.B.S Grewal, Higher Engineering Mathematics, 45th Edition, Khanna Publishers.
2. M.K.Jain, S.R.K.Iyengar and R.K.Jain, Numerical Methods for Science and Engineering Computation, 6th Edition, New Age International Publishers.

Reference Books:

1. R K Jain & S R K Iyengar, Advanced Engineering Mathematics, 5th Edition, Narosa Publishers.
2. Murray R Spiegel and Seymour Lipschutz, Vector Analysis, 2nd Edition, Schaums' Outlilne Series.
3. S.S.Sastry, Introductory Methods of Numerical Analysis, 5th Edition, PHI Learning Pvt. Ltd.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc17_ma14/preview
2. nptel.ac.in/courses/117101056/17

Course Outcomes:

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

1. Find the root of the equation and solution of a system of equations.
2. Fit a curve for the given data.
3. Find the Numerical solutions for a given first order initial value problem.
4. Use Laplace Transform techniques for solving ODE's.
5. Verify the irrotational and solenoidal fields and find the potential function.
6. Evaluate the line, surface and volume integrals and converting them from one to another.

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	L	T	P	C
I Year B.Tech. CSE (AI&ML) II-Semester				
Course Code: HS122AJ	**2**	**-**	**-**	**2**

ENGLISH
(Common to CST, CSM & CSD)

Prerequisites: -Nil-

Course Objectives:
1. To enable the students to understand the importance of English and to develop their basic proficiency in the English language.
2. To train the students to expand their vocabulary and to understand the usage of vocabulary technically and literally.
3. To develop the reading competence of the students through the sub skills of reading.
4. To equip the students with an ability to produce grammatically correct sentences and coherently well-developed paragraphs.
5. To enable the students to develop an appreciation of how the formal elements of language and genre shape meaning and to gain richer understanding of both the text and the cultural context.

UNIT 1: (~ 7 Lecture Hours)
- **Reading Comprehension**: Short story *Cause, Then Cure* from **Wise and Otherwise** by Sudha Murthy. *Reading Skills*: SQW3R Method and guessing and predicting.
- **Vocabulary Building**: Word formation – Root words – Prefixes and Suffixes – Word formation.
- **Remedial Grammar**: Error correction related to: Subject – Verb Agreement, Noun – Pronoun Agreement, and other aspects that are reflected through their writing.
- **Writing Skills**: Sentence structure – Use of Phrases and Clauses in sentences - Sentence Types: Assertive, Declarative, Interrogative, Exclamatory, sentences and Simple, Compound, Complex and Compound-Complex Sentences - Usage of punctuation marks.

UNIT 2: (~ 7 Lecture Hours)
- **Reading Comprehension:** Poem*Caged Bird* from **A Collection of Hundred Poems** by Maya Angelou. *Reading Skills*: STEM Technique, vocabulary and intended meaning.
- **Vocabulary Building:** Synonyms - Antonyms - Acronyms - Abbreviations
- **Remedial Grammar:** Error Correction related to: Articles and Prepositions, Tenses, Conditional clauses, Tag Questions; and other aspects that are reflected through their writing.
- **Writing Skills:** Principles of Paragraph writing - Cohesive Devices - Creating Coherence - Topic sentence and supporting sentences in a Paragraph - Techniques for writing Precisely - Jumbled sentences.

UNIT 3: (~ 6 Lecture Hours)

- **Reading Comprehension:** General Reading versus Academic Reading
  *Reading Skills***:** Reading for gist, main ideas, specific details.
- **Vocabulary Building**: Homophones - Homonyms –Homographs - Words often confused.
- **Remedial Grammar**: Error correction related to: Adjectives and Adverbials, Misplaced modifiers, Redundancies; and other aspects that are reflected through their writing.
- **Writing skills**: Precis writing and Summarizing.

UNIT 4: (~ 6 Lecture Hours)

- **Reading Comprehension:** Excerpt from **Wings of Fire: An Autobiography** *Looking Ahead* from APJ Abdul Kalam with Arun Tiwari *Abridged version.*
  Reading Skills: Reading for inference, discourse markers, contextualization, summarizing.
- **Vocabulary Building:** Phrasal verbs – collocations – Idioms.
- **Remedial Grammar**: Error corrections related to: Adverbs and Adjectives, Syntactical errors and punctuation marks; and other aspects that are reflected through their writing.
- **Writing Skills**: Letter Writing – Introducing oneself – Statement of Intent – Asking for direction – Seeking / giving information – Apologizing.

UNIT 5: (~ 6 Lecture Hours)

- **Reading Comprehension**: Travelogue *The Pamplona Clone: Jallikattu*from **Intriguing India – The Historic South** by Hugh and Colleen Gantzer.
  Reading Skills: Understanding the organization of text, global comprehension.
- **Vocabulary Building:** One-word substitute - General vocabulary versus Academic vocabulary - Literal meaning versus contextual meaning.
- **Remedial Grammar:** Sentence corrections and Editing and proof reading; and other aspects that are reflected through their writing.
- **Writing Skills**: Letter of Application: Covering letter and Resume Writing.

Note: The content prescribed for Reading Comprehension is for Reading Practice only and shall not be given for assessment and evaluation. An unknown Reading Passage shall be given for assessment and evaluation to test the Reading Skills.

Text Books:

1. Vibrant English by Orient Blackswan, 2013.
2. Language and Life: A Skills Approach by Orient Black Swan, 2018.

Reference Books:

1. Sudha Murthy, *Wise & Otherwise – A Salute to Life* Penguin Books, 2006.
2. Hugh and Colleen Gantzer, *Intriguing India – The Historic South* NIYOGI Books, (2012).
3. Collection of Poems //www.poetryfoundation.org//
4. Mukul Chowdhry, Simplified and abridged *Wings of Fire: An Autobiography*, *APJ Abdul Kalam with Arun Tiwari* University Press Pvt. Ltd. (2004).

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc16_hs01
2. https://nptel.ac.in/courses/109106094/5

Course Outcomes:

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

1. Read complex texts actively comprehending the literal and figurative use of language and be able to read in-between the line.
2. Write grammatically correct sentences and coherently well- developed paragraphs.
3. Apply the reading techniques and comprehend the passages critically.
4. Use appropriate vocabulary in the given context.
5. Appreciate how different genres use language and shape meanings.
6. Articulate clear questions, to provoke critical thinking, and ideas in class discussion to speak confidently in public.

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	L	T	P	C
I Year B.Tech. CSE (AI&ML) II-Semester				
Course Code: ES122AE	**1**	**-**	**3**	**2.5**

ENGINEERING GRAPHICS

(Common to CSM & CSD)

Prerequisites: -Nil-

Course Objectives:

The course will enable the students

1. To impart skills of drawing instruments and their use to convey exact and complete information of any object.
2. To construct conics and cycloidal curves used for various engineering applications.
3. To impart knowledge about standard principles of orthographic projection of objects.
4. To develop different surfaces of simple solids.
5. To differentiate between isometric view and projection and conversion of isometric views to orthographic views vice-versa.

UNIT 1: (~ 4 Lecture Hours and 12 Practical Hours)
Introduction to Engineering Graphics: Principles of Engineering Graphics and their significance, Conic Sections-general and special methods, Cycloid, Epi- cycloid and Hypo-Cycloid.

UNIT 2: (~ 3 Lecture Hours and 9 Practical Hours)
Orthographic Projections: Principles of Orthographic Projections – Conventions - Projections of points, straight lines and planes.

UNIT 3: (~ 3 Lecture Hours and 9 Practical Hours)
Projection of Solids: Projections of solids in simple position (prisms, pyramids, cylinders and cone), axis inclined to one plane, Axis inclined to both the reference planes, Projection of solids using auxiliary plane method.

UNIT 4: (~ 3 Lecture Hours and 9 Practical Hours)
Development of Surfaces: Basic concepts of development of surfaces, Methods of development – Parallel line development and radial line development, Development of prisms, pyramids, Cylinders and cones.

UNIT 5: (~ 3 Lecture Hours and 9 Practical Hours)
Isometric & Orthographic Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric views of Lines, Plane figures, Simple Solids – Conversion of Isometric Views to Orthographic Views.

Text Books:

1. Basanth Agrawal, Agrawal C.M., Engineering Graphics, First Edition, Tata McGraw Hill, 2012.
2. Bhatt N.D., Elementary Engineering Drawing, 2014, Charotar Publishers.

Reference Books:

1. K .L. Narayana and P.Kannaiah, Engineering Drawing, Scitech, 2010.
2. Venugopal.K, Engineering Drawing and Graphics Plus Autocad, New Age International (P) Ltd., New Delhi, 2010.
3. Gill P.S., Engineering Drawing: Geometrical Drawing, SK Kataria & sons, 2012.
4. Dhananjay A Jolhe, Engineering Drawing, Tata McGraw Hill, 2014.

Online Resources:

1. www.engineeringdrawing.org
2. Virtual labs (www.vlab.co.in)

Course Outcomes:

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

1. Know and understand the conventions and methods of Engineering Graphics.
2. Construct the conics using different methods and cycloidal curves.
3. Draw and understand about orthographic projections of points, straight lines and planes.
4. Improve visualisation skills in different types of solids.
5. Draw and understand about the development of surfaces of various solids.
6. Ability to read, understand and interpret engineering drawings.

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	L	T	P	C
I Year B.Tech. CSE (AI&ML) II-Semester				
Course Code: BS12208	**-**	**-**	**3**	**1.5**

PHYSICS LAB
(Common to CSM & CSD)

Prerequisites: -Nil-

Course Objectives:

1. Students are introduced to handling different instruments to conduct experiments as well as to interpret the data.
2. Students are introduced to experiments as to interpret the data and correlate the same with their understanding of its theory.
3. The objective of the course is to enable students to design experiments and analyses the concepts.

LIST OF EXPERIMENTS:

1. Dispersive power of the material of a prism – Spectrometer.
2. Determination of wavelengths of white source – Diffraction grating.
3. Newton's Rings – Radius of curvature of Plano convex lens.
4. Melde's experiment – Transverse and longitudinal modes.
5. Time constant of an R-C circuit (Charging and Discharging).
6. L-C-R circuit. – Resonance & Q-factor (series / Parallel).
7. Magnetic field along the axis of current carrying coil – Stewart and Gees method and to verify Biot – Savart's law.
8. Evaluation of numerical aperture of a given optical fiber.
9. Bending and attenuation losses of fibers.
10. Energy gap of a material of p-n junction.
11. Torsional pendulum – Rigidity modulus.
12. Wavelength of light and determining the LPI of unknown grating of a diffraction grating using laser.
13. V-I characteristics of a solar cell.
14. Quantum dots (Beyond syllabus).

Note: Minimum 12 experiments must be performed.

Text Books:

Manual as prepared for the college by the faculty.

Online Resources:

1. http://www.bsauniv.ac.in/UploadImages/Downloads/PHYSICS-LAB-MANUAL2017-(new-regulation).pdf
2. http://jnec.org/Lab-manuals/FE/Physics.pdf
3. https://www.myphysicslab.com/ (simple simulations)
4. https://www.iist.ac.in/departments/physics-lab
5. https://wci.llnl.gov/simulation

Course Outcomes:

After completion of the course, students will be able to

1. Handle different measuring instruments and asses their accuracy of measurement.
2. Experiment and analyze the results to derive valid conclusions.
3. Compare the experimental results with those introduced in lecture, draw relevant conclusions and substantiate.
4. Develop the experimental skills to design new experiments in engineering.
5. Understand the ethics of working environment and deliver the results in time.
6. Engage themselves in team work and understand each other's strengths.

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	L	T	P	C
I Year B.Tech. CSE (AI&ML) II-Semester				
Course Code: HS12212	**-**	**-**	**2**	**1**

ENGLISH PROFESSIONAL AND COMMUNICATION SKILLS LAB
(Common to CST, CSM & CSD)

Prerequisites: -Nil-

Course Objectives:
1. To introduce the students to the pronunciation symbols and associated sounds of English.
2. To enable the students understand the concept of syllable, word accent and intonation.
3. To enhance the listening skills to understand the nuances of accent, expression, tone and intended meaning to make them understand the difference between stress timed language and syllable timed language.
4. To help the students overcome their inhibitions while speaking English fluently thereby to build their confidence to express their ideas in English.
5. To help the students understand the importance of inter-personal communication, team dynamics and role behavior at the work place.

List of Activities:

Multimedia Lab:

1. **Introduction to the Phonetic symbols and associated sounds of English:** Vowels – Consonants – Diphthongs. *Extensive practice through referring to a dictionary.*
2. **Word Accent and Pronunciation:** Defining Syllable – Marking Word Accent – Rules of Word Accent - Accent shift versus Suffixes. *Extensive practice through List of words, Homographs, Silent letters.*
3. **Intonation:** Introduction to Stress and Rhythm - Tonal groups – weak forms Tone versus context – Falling Tone, Rising Tone, Fall and Rise in Tone. *Extensive Practice through listening to different genres – Speech, Poetry, Story, Conversations, Discussions, Talks.*
4. **Vocabulary Building:** Practice exercises in vocabulary through word bank and corpus list.
5. **Listening skills:** Focused Listening **-** Listening to understand main ideas and specific information and to recognize the opinions, attitudes and purpose of a speaker.

Communication Skills Lab:

1. **Situational Dialogues/ Role Plays:** Formal – Semiformal – informal situations – Punctuation Marks – Tonal variations and voice modulations. *Practice in two-way conversations, Discussions, Talks and Interviews.*
2. **Communication skills at workplace:** Task based activities for: Intra-personal and Inter-personal communications – Types of communications: oral, written and non-verbal - Group dynamics.
3. **Oral Presentations:** Prepared and Extempore **-** Poster Presentations and JAM [Just A Minute] - Choosing a topic – Developing the content – Choosing appropriate vocabulary - Coherence in presentation – Audibility.
4. **Mini Project** – ***In campus Survey Report:*** Project selection – Team size – Preparing a questionnaire – data collection – data analysis – conclusions and recommendations – Report submission in Manuscript format.

5. **Group Discussions:** Definition of GD – Importance of GD – Stages of GD – Etiquette, Communications, Content, Approach during GD – Individual Roles – Group goals - Types of GD - Expectations and outcomes.

Reference Books:

1. J.Sethi, Kamlesh Sadanand & DV Jindal A Practical Course in English Pronunciation (with two Audio Cassettes) Prentice-Hall of India Pvt.Ltd., New Delhi.
2. T.Balasubramanian, A text book of English Phonetics for Indian Students Macmillan Publications.
3. RK.Bansal and JB.Harrison, Spoken English Orient Longman, 2006.
4. Krishna Mohan & NP Singh, Speaking English Effectively Macmillan Publications.
5. Business English Communication – Preliminary Cambridge University Press.

Course Outcomes:

After learning the contents of this course, the students will be able to

1. Differentiate between the letters of alphabet and the phonetic symbols.
2. Demonstrate the right pronunciation of the words in English using phonetic transcription and word stress.
3. Speak with the proper intonation, voice modulation and tonal groups.
4. Demonstrate the listening skills through language modules.
5. Speak with clarity and confidence individually and in groups to discuss and present the topics chosen and understand the nuances of team dynamics.
6. Work individually and in teams present the topics and demonstrate their public speaking skills and presentation skills through various aids like posters, PPTs etc.,

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	L	T	P	C
I Year B.Tech. CSE (AI&ML) II-Semester				
Course Code: ES12210	-	-	3	1.5

COMPUTATIONAL MATHEMATICS LAB

(Common to CST, CSM & CSD)

Prerequisites: Programming for Problem Solving.

Course Objectives:

1. To illustrate the Flow chart and design an algorithm for the given method.
2. To develop conditional and iterative statements to solve system of linear equations using C language.
3. To inscribe C program that use pointers and functions to find the root of given equation.
4. To implement loops, arrays and strings to solve differential equations in C language.

List of Experiments:

1. Write a C Program to find the addition, subtraction, multiplication of matrices.
2. Write a C Program to find the root of a given equation using Bisection method**.**
3. Write a C Program to find the root of a given equation using method of False position.
4. Write a C Program to find the root of a given equation using Iteration method.
5. Write a C Program to find the root of a given equation using Newton Raphson method.
6. Write a C Program to solve a given system of linear equations using Jacobi's method.
7. Write a C Program to solve a given system of linear equations using Gauss Seidel iteration method.
8. Write a C Program to evaluate definite integral using Trapezoidal rule, Simpson's $1/3^{rd}$ rule and $3/8^{th}$ rule.
9. Write a C Program to solve a given differential equation using Taylor's series.
10. Write a C Program to solve a given differential equation using Picard's method.
11. Write a C Program to solve a given differential equation using Euler's method.
12. Write a C Program to solve a given differential equation using Runge-Kutta method.

Text Books:

1. M.K.Jain, S.R.K.Iyengar, and R.K.Jain, Numerical Methods for Scientific and Engineering Computation, 6^{th} Edition, New Age International Publishers.
2. E Balagurusamy, C Programming and Data Structures, 4^{th} Edition, Tata McGraw-Hill Publications.

Reference Books:

1. Pradip Niyogi, Numerical Analysis and Algorithms, 5^{th} Edition, Tata McGraw-Hill Publishers.
2. Yashavant Kanetkar, Let us C-C Programming, 3^{rd} Edition, Schaums' outline series.

Online Resources:

1. http://nptel.ac.in/noc/individual_course.php?id=noc15-cs05
2. http://www.codingalpha.com/numerical-methods-c-program/

Course Outcomes:

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

1. Write Flow chart and algorithm for the given program.
2. Have the ability to write C programs to solve specified problems.
3. Find the root of a given equation using C program.
4. Use arrays as part of the software solution.
5. Utilize pointers to efficiently solve problems.
6. Use functions from the portable C library.

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	L	T	P	C
I Year B.Tech. CSE (AI&ML) II-Semester				
Course Code: ES12211	**1**	**-**	**3**	**2.5**

ENGINEERING WORKSHOP

(Common to CSM & CSD)

Prerequisites: -Nil-

Course Objectives:

The course will enable the students

1. To study of different hand operated Power Tools, uses and their demonstration.
2. To gain a good basic working knowledge required for the production of various engineering products.
3. To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the Engineering field.
4. To develop a right attitude, team working, precision and safety at work place.
5. To study commonly used carpentry joints.
6. To have practical exposure to various welding and joining processes.

I) Trades for Exercises: (~ 12 Lecture Hours and 36 Practices)

At least two exercises from each trade:

i) Carpentry
ii) Fitting
iii) Tin-Smithy and Development of jobs carried out and Soldering
iv) House-wiring
v) Foundry
vi) Black smithy

II) Trades for Demonstration and Exposure: (~ 12 Lecture Hours)

i) Plumbing
ii) Machine Shop
iii) Wood Turning
iv) Welding

Text Books:

1. B.L. Juneja, Workshop Practice, Cengage publications.
2. K. Venugopal, Workshop Manual, Anuradha Publications.

Reference Books:

1. P. Kannaiah & K. L. Narayana, Workshop manual, 2nd Edition, Scitech publications (I) Pvt. Ltd., Hyderabad.
2. K. Venugopal, Dr. V. Prabhu Raja, G. Sreekanjana “Workshop Manual” 1st Edition, Anuradha Publications, 2012.
3. Hajra Choudury S.K., Hajra CHoudury A.K. and Nirjhar Roy S.K., Elements of Workshop technology, volI 2008 and Vol II 2010, Media Promoters and Publishers private limited, Mumbai.

Online Resources:

1. www.technologystudent.com

Course Outcomes:

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

1. Demonstrate and understand the Engineering workshop safety regulations.
2. Identify and use marking tools, measuring equipment and to work to prescribed accuracies.
3. Know various operations in basic engineering workshops.
4. Understand the practical difficulties encountered in industries during any assembly work.
5. Do simple electrical work through their carrier.
6. Design different prototype in the fittings, carpentry, foundry, black smithy and sheet metal work.

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	L	T	P	C
II Year B.Tech. CSE (AI&ML) I-Semester				
Course Code: BS123AL	**3**	**-**	**-**	**3**

PROBABILITY AND STATISTICS

(Common to CST & CSM)

Prerequisites: -Nil-

Course Objectives:

1. To learn the random variables and theoretical probability distributions.
2. To study the sampling distribution of mean and testing of hypothesis.
3. To learn the concept of confidence interval for proportions and small sample tests.
4. To check and determine the relation between two variables/attributes.

UNIT 1: (~10 Lecture Hours)
Random Variables: Introduction to random variables, Discrete random variable, Continuous random variable, Probability distributions and cumulative distribution functions, properties, Mathematical expectation.

UNIT 2: (~10 Lecture Hours)
Probability Distributions: Binomial distribution, Poisson distribution, Normal distribution, Sampling Distribution of means. (σ Known and unknown).

UNIT 3: (~12 Lecture Hours)
Theory of Estimation: Point estimation, Interval estimation, Confidence interval for mean.
Inference Theory (Large Samples): Null hypothesis, Alternate hypothesis, Type I and Type II errors, Critical region, Test of significance for single mean, Test of significance for difference of means.

UNIT 4: (~10 Lecture Hours)
Testing of Hypothesis: Confidence interval for proportions, Test of significance for single and difference of proportions.
Small sample tests: t, F and Chi-Square distributions.

UNIT 5: (~6 Lecture Hours)
Correlation and Regression: Coefficient of correlation, Rank correlation, Regression coefficient, Lines of regression, multiple correlation and regression.

Text Books:

1. S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical Statistics, 11th Edition, Sultan Chand & Sons.
2. Vijay K Rohatgi, Statistical Inference, Aug 2003, Dover Publications Inc.

Reference Books:

1. S.P.Gupta, Statistical Methods, 33rd Edition, Sultan Chand & Sons.
2. M.K.Jain, S.R.K.Iyengar and R.K.Jain, Numerical Methods for Science and Engineering Computation, 6th Edition, New Age International Publishers.
3. Miller and John E Freund, Probability and Statistics for Engineers, 5th Edition.

Online Resources:

1. http://nptel.ac.in/courses/111105090/
2. http://nptel.ac.in/courses/111106112/

Course Outcomes:

After completion of the course, students will be able to

1. Differentiate among the random variables involved in the probability models which are useful for all branches of engineering.
2. Understand probability distributions such as Binomial, Poisson and Normal distributions.
3. Analyze data and draw conclusion about collection of data under study using theory of estimation.
4. Apply testing of hypothesis for large samples.
5. Apply testing of hypothesis for small samples.
6. Estimate and establish relation between variables using correlation and regression analysis.

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II Year B.Tech. CSE (AI&ML) I-Semester				
Course Code: BS123AZ	**3**	**-**	**-**	**3**

DISCRETE MATHEMATICS

(Common to CST & CSM)

Prerequisites: -Nil-

Course Objectives:

1. Introduce the concepts of mathematical logic.
2. Gain knowledge in sets, relations and functions.
3. Solve problems using counting techniques and combinatorics.
4. Introduce generating functions and recurrence relations.
5. Use Graph Theory for solving real world problems.

UNIT 1: (~ 10 Lecture Hours)
Mathematical Logic: Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, Functionally complete set of connectives, Inference Theory of Statement Calculus, Predicate Calculus, Inference theory of Predicate Calculus.

UNIT 2: (~ 10 Lecture Hours)
Set theory: Basic Concepts of Set Theory, Relations and Ordering, Functions-composition of functions, Inverse Functions, Recursive Functions, Lattices and its properties.
Algebraic structures: Algebraic systems-Examples and General Properties, Semi groups and Monoids, groups, sub groups, homomorphism, Isomorphism.

UNIT 3: (~ 9 Lecture Hours)
Elementary Combinatorics: Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems, The Principle of Inclusion- Exclusion, Pigeon hole principle and its application.

UNIT 4: (~ 8 Lecture Hours)
Recurrence Relations: Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence relations, Solving Recurrence Relations by Substitution and Generating functions, The Method of Characteristic roots, Solutions of Inhomogeneous Recurrence Relations.

UNIT 5: (~ 8 Lecture Hours)
Graphs: Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four Color Problem.

Text Books:

1. Joe L. Mott, Abraham Kandel and Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition, Pearson Education.
2. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 2002.

Reference Books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, McGraw Hill Education (India) Private Limited.
2. D.S. Malik and M.K. Sen, Discrete Mathematics, Theory and Applications, Revised Edition, Cengage Learning.
3. C. L. Liu and D. P. Mohapatra, Elements of Discrete Mathematics, A Computer Oriented Approach, 4th Edition, McGraw Hill education (India) Private Limited.
4. Thomas Koshy, Discrete Mathematics with Applications, Elsevier Academic Press, 2012.

Online Resources:

http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf

Course Outcomes:

After completion of the course, students will be able to

1. Apply mathematical logic to solve problems.
2. Understand the concepts and perform the operations related to sets, relations and functions.
3. Gain the conceptual background needed and identify structures of algebraic nature.
4. Apply basic counting techniques to solve combinatorial problems.
5. Formulate problems and solve recurrence relations.
6. Apply Graph Theory in solving computer science problems.

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	L	T	P	C
II Year B.Tech. CSE (AI&ML) I-Semester				
Course Code: ES123AN	**3**	**-**	**-**	**3**

DIGITAL LOGIC DESIGN

(Common to CST, CSM & CSD)

Prerequisites: -Nil-

Course Objectives:

1. Understand basic number systems, codes and logical gates.
2. Know the concepts of Boolean algebra and minimization logic.
3. Learn the design of combinational and sequential circuits.
4. Know the basics of various types of memories.
5. Study the hardware implementation using Programmable Logic Devices.

UNIT 1: (~10 Lecture Hours)
Fundamentals of Digital Design: Digital Systems, Binary Numbers, Number Base Conversions, Octal, Hexadecimal and other Base numbers, Complements, Signed Binary Numbers, Binary Codes, Error Detection and Correction, Binary Logic, Boolean Algebra: Basic theorems and properties of Boolean Algebra, Boolean functions, Digital Logic Gates.

UNIT 2: (~7 Lecture Hours)
Minimization of Logic Functions: Standard representation for logic functions, K-Map representation, Simplifications of logic functions using K-Map, Sum of products , Product of sums simplification, Don't care conditions , NAND and NOR implementations.

UNIT 3: (~10 Lecture Hours)
Combinational Digital Circuits: Combinational Circuits(CC), Design Procedure, Combinational circuit for different code converters and Parity generator/Checker, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, De-multiplexers, ALU: Micro-operations, Arithmetic Logic Shift Unit.

UNIT 4: (~10 Lecture Hours)
Sequential Circuits and Systems: Synchronous Sequential Circuits, Latches, Flip-flops, Analysis of clocked sequential circuits, Registers, Shift registers, Ripple counters, Synchronous counters, other counters and Applications of counters.
Asynchronous Sequential Circuits -Introduction, Analysis procedure, Circuits with latches, Design procedure.

UNIT 5: (~8 Lecture Hours)
Semiconductor Memories and Programmable Logic Devices: Memory: Introduction, Read-Write Memory (RAM), Read Only Memory (ROM), Memory decoding, Programmable Logic Array, Programmable Array Logic, Sequential programmable devices: SPLD, CPLD, FPGA.

Text Books:

1. M. Morris Mano and M.D.Ciletti, Digital Design, 5th Edition, Pearson.
2. R.P. Jain, Modern Digital Electronics, Tata McGraw Hill Education, 2009.

Reference Books:

1. A. Kumar, Fundamentals of Digital Circuits, Prentice Hall India, 2016.
2. M.Morris Mano, Computer System Architecture, 3rd Edition, Pearson.
3. H. Roth and L. L. Kinney, Fundamentals of Logic Design, 7th Edition, Cengage Learning.
4. M. Rafiquzzaman, Fundamentals of Digital Logic & Micro Computer Design, 5th Edition, John Wiley.

Online Resources:

1. www.tutorialspoint.com/digital_circuits/index.htm
2. https://onlinecourses.nptel.ac.in

Course Outcomes:

After completion of the course, students will be able to

1. Demonstrate different Number systems, Binary codes and Boolean algebra.
2. Solve Boolean expressions using minimization methods.
3. Understand the concepts of Combinational circuits and design simple applications.
4. Distinguish different types of Sequential circuits.
5. Describe functionality of memory devices.
6. Design Hardware that suits various Micro-Operations.

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	L	T	P	C
II Year B.Tech. CSE (AI&ML) I-Semester				
Course Code: PC123NA	**3**	**1**	**-**	**4**

DATA STRUCTURES USING C

(Common to CSM & CSD)

Prerequisites: Programming for Problem Solving

Course Objectives:

1. Understand the notations used to analyze the performance of algorithms.
2. Understand and analyze various searching and sorting algorithms.
3. Understand the behaviour of data structures such as stacks, queues, trees, hash tables, search trees, graphs and their representations.
4. Choose an appropriate data structure for a specified application.
5. Introduces tries and pattern matching algorithms

UNIT 1: (~8 Lecture Hours)

Basic Concepts: Performance analysis – Time Complexity and Space Complexity, Asymptotic Notation – Big O, Omega and Theta notations, Complexity Analysis Examples.
Searching: Linear Search, Binary Search, Interpolation Search.
Sorting: Insertion Sort, Selection Sort, Quick Sort, Merge Sort, Radix Sort, External Sorting- Model for External Sorting, Comparison of Sorting Methods.

UNIT 2: (~10 Lecture Hours)

Introduction to Data Structures: Linear and Non-linear data structures.
Linear List: Array and Linked Representations, Singly Linked List, Operations – Insertion, Deletion and Searching, Circularly Linked List, Operations – Insertion, Deletion and Searching, Doubly Linked List, Operations– Insertion, Deletion and Searching, Applications of Linked List – Sparse matrix.
Stack: Definition, Array and Linked implementations, Applications– Infix to Postfix Conversion, Postfix Expression Evaluation, Recursion.
Queue: Definition, Array and Linked implementations, Circular Queues–Insertion and Deletion Operations, Double ended Queue.

UNIT 3: (~8 Lecture Hours)

Trees: Definitions, Terminology, Applications, Properties, Binary Tree - Array and Linked representations, Binary Tree Traversals, Threaded Binary Tree.
Priority Queues: Definition and Applications, Max Priority Queue – Implementation, Max Heap - Definition, Insertion and Deletion, Heap Sort.

UNIT 4: (~9 Lecture Hours)

Search Trees: Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion.
Balanced Search Trees: AVL Trees, Operations – Insertion, Deletion and Searching, B-Trees, Operations – Insertion, Deletion and Searching, Red–Black Trees.
Graphs: Definitions, Terminology, Applications, Properties, Graph Representations-Adjacency Matrix, Adjacency Lists, Graph Traversal Methods – DFS and BFS

UNIT 5: (~10 Lecture Hours)

Hashing: Introduction, Hash Tables, Hash Functions, Overflow Handling, Extended Hashing.

Dictionaries: Linear List Representation, Hash Table Representations, Operations - Insertion, Deletion and Searching.

Pattern Matching and Tries: Pattern Matching Algorithms-Brute Force, The Boyer – Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries.

Text Books:

1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C – A. S. Tanenbaum, Y. Langsam and M.J. Augenstein, PHI/Pearson Education.

Reference Books:

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B.A. Forouzan, Cengage Learning.
2. Data Structures and Program Design Using C: A Self-Teaching Introduction, D. Malhotra, N. Malhotra, Mercury Learning and Information.
3. D. Samanta, Classic Data Structures, 2nd Edition, PHI.

Online Resources

1. www.geeksforgeeks.org/data-structures
2. https://www.tutorialspoint.com/data_structures_algorithms/index.htm

Course Outcomes:

After completion of the course, students will be able to

1. Determine and analyze the complexity of given algorithms.
2. Implement various kinds of searching and sorting techniques.
3. Practice basic data structures such as linked list, stack and queue.
4. Design programs using advanced data structures like hash tables, binary trees, search trees, heaps and graphs.
5. Choose appropriate data structures as applied to specified problem definition.
6. Implement and know the application of algorithms for pattern matching.

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	L	T	P	C
II Year B.Tech. CSE (AI&ML) I-Semester				
Course Code: PC123BJ	**3**	**-**	**-**	**3**

DATABASE MANAGEMENT SYSTEMS

(Common to CST, CSM & CSD)

Prerequisites: -Nil-

Course Objectives:

1. Understand the basic concepts and the applications of database systems.
2. Master the basics of SQL and construct queries using SQL.
3. Understand the relational database design principles.
4. Become familiar with the basic issues of transaction processing and concurrency control.
5. Become familiar with database storage structure and recovery mechanisms.

UNIT 1: (~ 10 Lecture Hours)
Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages – DDL, DML, Relational Databases, Data Storage and Querying, Transaction Management, Database Architecture, Database Users and Administrators.
Database Design and the E-R Model: The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational schemas, Entity-Relationship Design Issues, Extended E-R Features.

UNIT 2: (~ 9 Lecture Hours)
Introduction to the Relational Model: Structure of Relational Databases, Database Schema, Schema Diagrams, The Relational Algebra, Tuple Relational Calculus, Domain Relational Calculus.
Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Subqueries.

UNIT 3: (~ 10 Lecture Hours)
Advanced SQL: Join Expressions, Views, Integrity Constraints, Triggers.
Normalization: Functional Dependencies, Lossless decomposition,1NF, 2NF, 3NF, Dependency Preservation, BCNF, Multi -valued dependencies, 4NF,Join Dependencies, 5NF.

UNIT 4: (~ 10 Lecture Hours)
Transaction Management: Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity, Transaction Isolation Levels.
Concurrency Control: Lock-Based Protocols, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols.

UNIT 5: (~ 9 Lecture Hours)
Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Failure with loss of non-volatile storage, Remote Backup systems.
Indexing: Ordered Indices, B+ -Tree Index files.

Text Books:

1. A. Silberschatz, Henry. F. Korth and S. Sudarshan, Database System Concepts, 6th Edition, McGraw Hill Education (India) Private Limited.
2. C.J. Date, A.Kannan, and S.Swami Nadhan, An Introduction to Database systems, 8th Edition, Pearson Education.

Reference Books:

1. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, 3rd Edition, McGraw Hill Education (India) Private Limited.
2. R Elmasri, Shamkant B. Navathe, Database Systems, 6th Edition, Pearson Education.

Online Resources:

1. www.w3schools.in/
2. https://beginnersbook.com/2015/04/dbms-tutorial/

Course Outcomes:

After completion of the course, students will be able to

1. Understand concepts and the applications of database systems and implement in real time applications.
2. Construct an Entity-Relationship (E-R) model from specifications and transform to relational model.
3. Demonstrate the basic concepts of relational database management system and construct unary/binary/set/aggregate queries in Relational Algebra and in SQL.
4. Apply normalization on database.
5. Understand principles of database transaction management.
6. Understand the storage and recovery of database.

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	L	T	P	C
II Year B.Tech. CSE (AI&ML) I-Semester				
Course Code: ES12370	**-**	**-**	**3**	**1.5**

IT WORKSHOP AND PYTHON PROGRAMMING LAB
(Common to CST, CSM & CSD)

Prerequisites: -Nil-

Course Objectives:
1. Acquire knowledge of PC & its peripherals and learn installation of OS.
2. Create web pages using HTML + CSS and create spreadsheets using MS-Excel.
3. Describe the core syntax and semantics of Python programming language.
4. Illustrate the process of structuring the data using lists, dictionaries, tuples, sets and strings.
5. Handle files and modules in python
6. Develop the skills of using python libraries

List of Experiments:

Week 1: PC Hardware:

a) Identification of the peripherals of a computer, components in a CPU and its functions.
b) Draw the block diagram of the CPU along with the configuration of each peripheral.
c) Disassembling and assembling the PC back to working condition.
d) Installation of OS (Windows and Linux)

Week 2: HTML & CSS

a) Develop pages using HTML consisting of Text, images, tables, lists, Hyperlinks.
b) Develop pages using HTML frames and Style sheets.

Week 3: MS Office - Excel

Spreadsheet Orientation: Accessing, overview of toolbars, saving spreadsheet files, Using help and resources

Creating a Scheduler: Features to be covered: Gridlines, Format Cells, Freezing Rows and Columns, Selecting Ranges, Summation, auto fill, Formatting Text.

Week 4: Excel functions

Calculating Grade Point Average: Features to be covered: - Cell Referencing, Formulae – sum, average, standard deviation, Count function, Solver, Sort, Filter, Conditional formatting.

Creating Charts: Understand chart terminology, select appropriate chart types for a specific set of data, create basic chart types, including column, pie, line, XY Scatter, and bar charts

Week 5: Python Programming

Introduction to Python, variables, number data types and operators in Python.

a) Write a program to demonstrate different number data types in Python.
b) Write a program to perform different Arithmetic Operations on numbers.

Week 6: Control Flow Statements

if statement, if…else statement, if…elif…else statement, nested if statement, while loop, for loop, continue and break statements

a) Write a python program to find largest of three numbers
b) Write a Python program to convert temperatures to and from Celsius, Fahrenheit. [Formula: c/5 = f-32/9]
c) Write a Python program that prints prime numbers less than 20(using for-else).
d) Write a Python program to construct the following pattern, using a nested for loop

```
1
2 2
3 3 3
4 4 4 4
5 5 5 5 5
4 4 4 4
3 3 3
2 2
1
```

e) Write a program to get the binary form of a given number.

Week 7: Lists

Creating Lists, Basic List operations, Indexing and Slicing in Lists, Built-in functions used on Lists, List methods, List comprehension.

a) Write a program to demonstrate various list methods in python.
b) Write a program to get a list of even numbers from a given list of numbers. (use only list comprehensions)

Week 8: Tuples and Sets

Tuples: Creating Tuples, Basic Tuple operations, Indexing and Slicing in Tuples, Built-in Functions used on Tuples, Relation between Tuples and Lists.

Sets: Set Methods, operations of sets.

a) Write a program to add an item in a tuple without converting into a list.
b) Write a program to count the elements in a list until an element is a tuple.
c) Write a Python program to demonstrate set operations.

Week 9: Strings and Dictionaries

Strings: Basic String operations, String slicing and joining, String methods.

Dictionaries: Creating Dictionary, Accessing and Modifying key-value pairs in Dictionaries, Built - in functions used on Dictionaries, Dictionary methods.

a) Write a program to access a sub string from a given string (Use slicing)
- Get the first 5 characters of a string
- Get a substring of length 4 from the 3rd character of the string
- Get the last 5 characters of a string
- Get a substring which contains all characters except the last 4 characters and the 1st character
- Get every other character from a string

b) Get a string from a given string where all occurrences of its first char have been changed to '$', except the first char itself
Eg: restart output: resta$t
c) Write a program to sort a dictionary by a value.
b) Write a program to display the count of individual vowels in the input string using dictionary. (Ex: Input String: “welcome” Output: {‘a’:0,’e’:2,’i’:0,’o’:1,’u’:0})

Week 10: Functions and Modules

Functions: Built-In Functions, Function definition and calling the function, The return statement and void function, recursion.
Classes and objects.
Modules: Importing Modules, Importing Module Attributes.

a) Write a python program to find N largest element from given list of integers using functions
b) Write a python program to find sum of elements of nested list using recursion. (Input: [9, 1, [3,4], [5,2]], Output:24)
c) Write a program to implement stack data structure using class.
d) Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
e) Define a module that consist of factorial and sum of individual digits of a number as functions. Write a program to find ${}^{n}c_{r}$ by importing only factorial function from the above module.

Week 11: Exception Handling and Files

Exception Handling: Catching exceptions using try and except statement,
user defined exceptions
Files: Creating files, File input/output methods

a) Write a program to handle exceptions using try..except..finally…else
b) Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered. (Handle exceptions)
c) Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.

Week 12: Visualization of Data using Python Libraries

Python Libraries: Introduction to python libraries and exploring Numpy, Pandas, matplotlib, seaborn.
a) Write a python program to demonstrate array operations using Numpy library.
b) Write a python program to plot a bar graph on any data set using pandas library.
c) Write a python program to plot a scatter plot on any data set using matplotlib library.
d) Write a python program to plot a box plot on any data set using seaborn library.

Text Books:

1. Introduction to Information Technology, ITL Education Solutions limited, 7th Edition, Pearson Education.
2. Manish Nigam, Advance Excel 2019 Training Guide: Tips and tricks to kick start your excel skills, BPB Publications.
3. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.
4. Gowrishankar S, Veena A, Introduction to Python Programming, 1st Edition, CRC Press/Taylor Francis, 2018. ISBN-13: 978-0815394372.

Reference Books:

1. Vikas Gupta, Comdex Information Technology Course Tool Kit, WILEY Dreamtech, 2005.
2. David Anfinson and Ken Quamme, IT Essentials PC Hardware and Software Companion Guide, 3rd Edition, CISCO Press, Pearson Education.
3. Kate J. Chase, PC Hardware and A+ Handbook, PHI (Microsoft), 2004.
4. Y Daniel Liang, Introduction to Programming Using Python, 1st Edition, Pearson India, 2017.
5. John Paul Mueller, Python for Data Science for Dummies, Wiley.

Online Resources:

1. www.w3schools.org.in
2. https://www.sgul.ac.uk/about/ourprofessionalservices/informationservices/library/documents/training-manuals/ExcelFundamentals-Manual.pdf
3. www.lynda.com
4. www.coursera.org

Course Outcomes:

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

1. Apply knowledge of PC & its peripherals in assembling PC and installation of OS.
2. Develop web pages and spreadsheets.
3. Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements.
4. Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples, sets and strings.
5. Develop the proficiency in handling of files and modules.
6. Make use of python libraries.

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	L	T	P	C
II Year B.Tech. CSE (AI&ML) I-Semester				
Course Code: PC12372	**-**	**-**	**3**	**1.5**

DATA STRUCTURES USING C LAB

(Common to CSM & CSD)

Prerequisites: Programming for Problem Solving

Course Objectives:

1. Learn to write programs to implement various sorting and searching algorithms.
2. Write and execute programs to solve problems using linear data structures such as arrays, linked lists, stacks and queues.
3. Write programs to implement various non-linear data structures like trees, graphs and search trees.
4. To learn and implement pattern matching techniques.

List of Experiments:

Week 1: Write a C program that uses functions to perform the following:

a. Search for a key element in a list of elements using linear search.
b. Search for a key element in a list of sorted elements using binary search.
c. Search for a key element in a list of sorted elements using interpolation search.

Week 2:

a. Write a C program that implements insertion sort algorithm to arrange a list of elements in descending order.
b. Write a C program that implements selection sort algorithm to arrange a list of elements in ascending order.
c. Write a C program that implements quick sort algorithm to arrange a list of elements in ascending order.

Week 3:

a. Write a C program that implements merge sort algorithm to arrange a list of elements in descending order.
b. Write a C program that implements radix sort algorithm to arrange a list of elements in ascending order.

Week 4:

a. Write a C program that uses functions to perform the following operations on a singly linked list: (i) Creation (ii) Insertion (iii) Deletion (iv) Display
b. Write a C program that uses functions to perform the following operations on a circularly linked list: (i) Creation (ii) Insertion (iii) Deletion (iv) Display

Week 5: Write a C program that uses functions to perform the following operations on a doubly linked list:

a. Creation b. Insertion c. Deletion d. Display

Week 6: Write a C program to implement stack using an array and a linked list.

Week 7:

a. Write a C program that uses stack operations to convert a given infix expression into its postfix equivalent. Implement the stack using an array.
b. Write a C program that uses stack operations to evaluate a given postfix expression. Implement the stack using an array.

Week 8: Write a C program to implement a queue using an array and a singly linked list.

Week 9: Write a C program that implements heap sort algorithm for sorting a list of integers in ascending order.

Week 10: Write a C program that uses functions to perform the following:

a. Create a binary search tree of integers.
b. Traverse the above binary search tree recursively in pre-order, in-order and post-order.
c. Search for an integer key in the above binary search tree recursively.
d. Traverse the above binary search tree non recursively in in-order.

Week 11: Write a C program to perform the following:

a. Traverse a given graph using DFS algorithm.
b. Traverse a given graph using BFS algorithm.

Week 12: Write a C program to perform the following:

a. To implement the functions of a dictionary using hashing
b. Implement the Brute Force and Knuth-Morris-Pratt pattern matching algorithms.

Text Books:

1. S. Sahni and Susan Anderson Freed, Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, Universities Press.
2. A. S. Tanenbaum, Y. Langsam and M. J. Augenstein, Data Structures using C – PHI/Pearson Education.

Reference Books:

1. R. F. Gilberg and B. A. Forouzan, Data Structures: A Pseudocode Approach with C, 2nd Edition, Cengage Learning.
2. D. Malhotra and N. Malhotra, Data Structures and Program Design Using C: A Self-Teaching Introduction, Mercury Learning and Information.

Online Resources:

1. www.cs.uh.edu/~rizk/teaching/cosc2430/books/Data Structures UsingC.pdf
2. www.geeksforgeeks.org/data-structures
3. https://www.tutorialspoint.com/data_structures_algorithms/index.htm

Course Outcomes:

After completion of the course, students will be able to

1. Analyze the time and space complexity of algorithm or program.
2. Implement various kinds of searching and sorting techniques.
3. Develop the programs for various linear data structures like stack, queue and linked list.
4. Implement non-linear data structures like graphs and trees.
5. Choose the appropriate data structure for solving real world problems.
6. Learn and implement different pattern matching algorithms.

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	L	T	P	C
II Year B.Tech. CSE (AI&ML) I-Semester				
Course Code: PC12328	-	-	3	1.5

DATABASE MANAGEMENT SYSTEMS LAB

(Common to CST, CSM & CSD)

Prerequisites: -Nil-

Course Objectives:

1. Understand the different issues involved in the design and implementation of a database system.
2. Learn and practice data modeling using the entity-relationship and developing database designs.
3. Understand and use data manipulation language to query, update, and manage a database.
4. Understand the significance of integrity constraints, triggers, assertions, views, procedures and cursors.

List of Experiments:

Week 1: Practicing DDL commands: Creating tables for various relations (in SQL).

Week 2: Practicing DML commands: Inserting data into relational tables.

Week 3: Practicing DRL commands: Retrieving data from tables**,** Implement all the operations like Union, Intersect, Minus, in, exist, aggregate functions (Min., Max) etc.

Week 4: Practicing Nested queries, Correlated queries, Group by and joins.

Week 5: Practicing DML commands: Updation and Deletion commands on tables

Week 6: Creating Views.

Week 7: Writing Assertions.

Week 8: Writing Triggers.

Week 9: Implementing Operations on relations (tables) using PL/SQL.

Week 10 – 12: **Case Study on Bus Reservation System**

Objective: To enable the students to practice the concepts learnt in the subject DBMS by developing a database using MySQL for example company named “Roadway Travels” whose description is as follows, The student is expected to practice the designing, developing and querying a database in the context of example database “Roadway travels”.

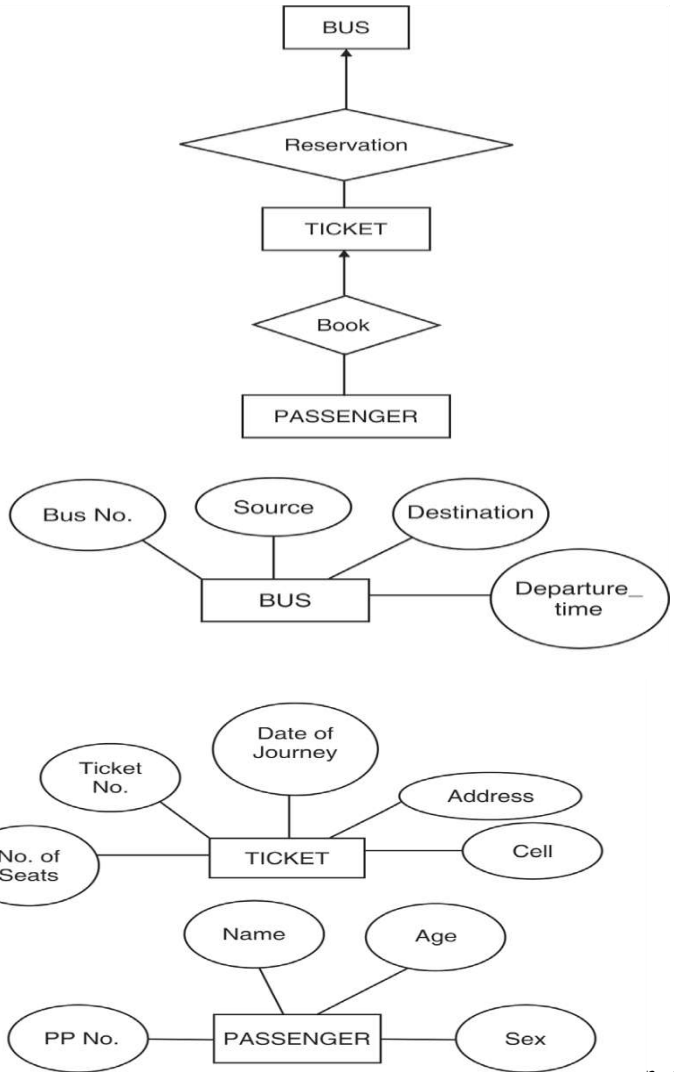
Bus reservation system:

Travelling is growing business in Telangana and other states of India, and even in some of other countries also. Buses are the public transport used to communicate between cities. The tickets for the buses have to be bought only by going to the station. This wastes a lot of time as one has to go to the station buy a ticket.

To save time and efforts, many agents are allowed to give reservation at different places of a city or town, such that we can reserve a ticket by walking to a nearest place than going to a faraway bus station. This facility made public happier. Of course we can give our cell phone number of the person who is boarding the bus such that the message will be sent to that cell phone number; such that the person can board into the bus just by showing the message of the cell phone without producing the printed ticket even. It is convenient for booking ticket for the children who are studying at some other place also.

Then it leads to the concept of online reservation through Internet by sitting at your home using your credit card. The state of art of private bus reservations now are a ticket can be booked online by using our table top or laptop with our credit card by giving our children cell phone number from our house, even without walking to the nearest agent. Of course, we can do reservation even at mid night, or early morning when the nearest agent's office is not available.

Enquiries can be performed by us through Internet for the availability of buses, timings and seats of different facilities. Different statistical details are required for analysis for the sake of scheduling new buses, or rescheduling the existing bus.



a) Creation of Tables /relations as per the case study. For example: BUS (Bus_No, Source, Destination, Departure_Time) Ticket (RC,Ticket_No,Bus_No, Date_of_journey, No_Seats, Cell_No, Address), Passenger (PPNO,Ticket_No, Name, Age, Sex)

b) Normalization of tables.
c) Inserting data into the tables.
d) Practice the following Queries:
    i. Display unique PPNO of all passengers.
    ii. Display all the names of male passengers.
    iii. Display the ticket numbers and names of all the passengers.
    iv. Find the names of passengers whose age is between 30 and 45.
    v. Display the sorted list of passenger's names.
    vi. Write a Query to display the Information present in the Passenger and cancellation tables.
    vii. Find the total number of cancelled seats.
e) Design and develop the following:
    i. Trigger ii. Cursor

Text Books:

1. Vikram Vaswani, The Complete Reference MySQL, 1st Edition, McGraw Hill Education (India) Private Limited.
2. Joan Casteel, Oracle 10 g: SQL, 1st Edition, Thomson Course Technology.

Reference Books:

1. A. Silberschatz, Henry. F. Korth and S. Sudarshan, Database System Concepts, 6th Edition, McGraw Hill Education (India) Private Limited.
2. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, 3rd Edition, McGraw Hill Education (India) Private Limited.

Online Resources:

1. https://dev.mysql.com/doc/
2. https://docs.oracle.com/en/database/
3. https://www.w3schools.in/

Course Outcomes:

After completion of the course, students will be able to

1. Analyze the requirements of database application.
2. Design ER model for the given problem.
3. Convert ER diagram to relational database schema.
4. Apply normalization techniques for development of application software to realistic problems.
5. Formulate queries using SQL DML/DDL/DCL commands.
6. Apply triggers, cursors and stored procedures.

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	L	T	P	C
II Year B.Tech. CSE (AI&ML) I-Semester				
Course Code: MC12317	**2**	**-**	**-**	**-**

GENDER SENSITIZATION

(Common to CST, CSM & CSD)
(Mandatory Course)

Prerequisites: -Nil-

Course Objectives:

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

UNIT 1: (~ 6 Lecture Hours)
Understanding Gender:
Gender: Why Should We Study It? (*Towards a World of Equals:* Unit -1)
Socialization: Making Women, Making Men (*Towards a World of Equals:* Unit - 2*)*
Introduction, Preparing for Womanhood, Growing up Male, First lessons in Caste, Different Masculinities.

UNIT 2: (~ 6 Lecture Hours)
Gender and Biology:
Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals:* Unit -4)
Declining Sex Ratio. Demographic Consequences.
Gender Spectrum: Beyond the Binary (*Towards a World of Equals:* Unit -10)
Two or Many? Struggles with Discrimination.

UNIT 3: (~ 7 Lecture Hours)
Gender And Labour:
Housework: The Invisible Labour (*Towards a World of Equals:* Unit -3)
"My Mother doesn't Work." "Share the Load."
Women's Work: Its Politics and Economics (*Towards a World of Equals:* Unit -7)
Fact and Fiction. Unrecognized and Unaccounted work.
Additional Reading: Wages and Conditions of Work.

UNIT 4: (~ 7 Lecture Hours)
Issues of Violence:
Sexual Harassment: Say No! (*Towards a World of Equals:* Unit -6)
Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu".
Domestic Violence: Speaking Out (*Towards a World of Equals:* Unit -8)
Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives.

Additional Reading: New Forums for Justice - Thinking about Sexual Violence (*Towards a World of Equals:* Unit -11) - Blaming the Victim- "I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

UNIT 5: (~ 6 Lecture Hours)
Gender: **Co - Existence**
Just Relationships: Being Together as Equals (*Towards a World of Equals:* Unit -12)
Mary Kom and Onler, Love and Acid just do not Mix, Love Letters, Mothers and Fathers, Additional Reading: Rosa Parks-The Brave Heart.

Text Books:
All the five Units in the Textbook, "**Towards a World of Equals: A Bilingual Textbook on Gender**" written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj,Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by **Telugu Akademi**, **Hyderabad**, Telangana State in the year 2015.

Reference Books:
1. Menon and Nivedita, Seeing like a Feminist, Zubaan-Penguin Books, New Delhi, 2012.
2. Abdulali Sohaila, "I Fought For My Life…and Won", Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

Online Resources:
1. http://textofvideo.nptel.ac.in/110105080/lec20.pdf

Course Outcomes:
Students will have developed a better understanding of important issues related to gender in contemporary India.
1. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
2. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
3. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
4. Men and women students and professionals will be better equipped to work and live together as equals.
5. Students will develop a sense of appreciation of women in all walks of life.
6. Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

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	L	T	P	C
II Year B.Tech. CSE (AI&ML) II-Semester				
Course Code: HS124BD	**3**	**-**	**-**	**3**

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

(Common to CST, CSM & CSD)

Prerequisites: -Nil-

Course Objectives:

1. To provide the basic concepts of economics.
2. To interlink the concepts of economics for effective business decision making.
3. To provide fundamental knowledge of accounting, process of preparing accounting statements and interpret them thereby.

UNIT 1: (~ 9 Lecture Hours)
Managerial Economics and Demand Analysis:
Managerial Economics: Introduction to Economics, Definition of Managerial Economics, Nature and Scope of Managerial Economics, Multidisciplinary nature of Managerial Economics, Role of Managerial Economist.
Demand Analysis: Introduction to Demand, Determinants of demand, Law of demand and its Exceptions, Nature of demand, Movement and Shift of demand curve.

UNIT 2: (~ 9 Lecture Hours)
Elasticity of Demand, Demand Forecasting and Production Analysis:
Elasticity of demand: Concept of Elasticity of demand, Types of Elasticity- Price, Income, Cross and Advertising. Factors affecting and Significance of Elasticity of demand.
Demand Forecasting: Need for Demand Forecasting - Factors governing Demand Forecasting, Methods of Demand Forecasting (Survey methods and Statistical methods).
Production Analysis: Factors of Production, Production Function, Production function with one variable input, two variable inputs using Isoquant and Isocosts. Optimal combination of Resources using Isoquants and Isocosts, Laws of returns, Economies and Diseconomies of Scale.

UNIT 3: (~ 10 Lecture Hours)
Cost Analysis, Market Structure and Pricing:
Cost Analysis: Cost concepts, Short run and Long run Cost analysis.
Market Structures: Classification of Markets, Features of Perfect Competition, Monopoly, Monopolistic, Oligopoly and Duopoly.
Pricing: Pricing Objectives, Methods of Pricing and Pricing Strategies.

UNIT 4: (~10 Lecture Hours)
Introduction to Financial Accounting:
Financial Accounting: Introduction to Accounting, Double Entry Book-Keeping, Accounting Principles, Accounting Terminology, Journal, Ledger, Trial Balance, Final Accounts with Adjustments (Simple Problems).

UNIT 5: (~10 Lecture Hours)
Financial Analysis and Interpretation:
Ratio Analysis: Need, importance and significance of Ratio Analysis, Liquidity Ratios, Profitability Ratios, Activity Ratios, Solvency Ratios, Interpretation of Ratios for decision making (Simple problems).

Reference Books:

1. P L Mehta, Managerial Economics, Analysis, Problems & Cases, 8th Edition, Sultan Chand & Sons, 2001.
2. S.N. Maheshwari, Suneel K Maheshwari, Sharad K. Maheshwari, Financial Accounting, 5th Edition, Vikas Publishing House Pvt. Ltd, 2015.
3. D.N.Dwivedi, Managerial Economics, 9th Edition, Vikas Publishing House Pvt. Ltd., 2016.
4. R.L.Varshney and K.L Maheshwari, Managerial Economics, 14th Edition, Sultan Chand & Sons, 2005.
5. T.S.Grewal, Double Entry Book Keeping, Sultan Chand & Sons, Reprint 2006.

Online Resources:

1. Managerial Economics http://nptel.ac.in/courses/110101005/162.
2. Financial Accounting http://nptel.ac.in/courses/110107073.

Course Outcomes:

After completion of the course, students will be able to

1. Cognize the Basic Concepts of Economics.
2. Analyze the economic concepts for using discretion in business problem solving.
3. Comprehend the concepts of Accounting for business decision making.
4. Assimilate the basic Accounting Procedure and interpret the statements.
5. Analogize the external business environment for attainment of business goals.
6. Enable forecasting and analyzing the external business environment.

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	L	T	P	C
II Year B.Tech. CSE (AI&ML) II-Semester				
Course Code: PC124BH	**3**	**-**	**-**	**3**

COMPUTER ORGANIZATION AND ARCHITECTURE

(Common to CST, CSM & CSD)

Prerequisites: Digital Logic Design

Course Objectives:

1. Know the basic components of computers.
2. Understand the architecture of 8086 processor.
3. Learn the instruction sets, instruction formats and various addressing modes of 8086.
4. Understand the memory and I/O organization.
5. Understand the parallelism both in terms of single and multiple processors.

UNIT 1: (~ 10 Lecture Hours)
Functional Blocks of a Computer: Introduction, Block diagram of digital computer, Instruction codes, Computer Registers, Common bus system, Computer instructions, Instruction cycle and Instruction set, Register Transfer Language.
Data Representation: Fixed and floating point arithmetic-Addition, Subtraction, Multiplication, Division.
Control unit Design: Hardwired control unit**,** Control memory, Address sequencing, Micro-programmed control unit design, Hardwired Vs Micro-programmed design.

UNIT 2: (~ 10 Lecture Hours)
The 8086 Microprocessor: Architecture, Register organization, 8086 signal description, Physical memory organization, Minimum and Maximum mode system and timing diagrams, Addressing modes, 8086 Instruction Set and Assembler Directives, Assembly Language example programs, Stack structure of 8086, Interrupt structure of 8086, Interrupt vector table, Procedures and macros.

UNIT 3: (~ 7 Lecture Hours)
Peripheral Devices and their characteristics: Introduction, Input-Output Interface, Modes of Transfer-Programmed I/O, Priority Interrupt, Direct memory Access, Input – Output Processor (IOP), Intel 8089 IOP, Standard I/O interfaces – PCI, USB, SCSI.

UNIT 4: (~ 8 Lecture Hours)
Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory - Mapping functions, Replacement algorithms, Write policies.

UNIT 5: (~ 10 Lecture Hours)
Pipelining: Introduction, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors, Hazards.
Multiprocessors: Characteristics of Multiprocessors, Interconnection Structures, Inter processor arbitration, Inter processor communication and synchronization, Cache coherence.

Text Books:

1. M. Morris Mano, Computer System Architecture, 3rd Edition, Pearson.
2. K. M. Bhurchandi and A.K Ray, Advanced Microprocessors and Peripherals, 3rd Edition, Tata McGraw-Hill Education.

Reference Books:

1. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, 5th Edition, Elsevier.
2. Carl Hamacher, Computer Organization and Embedded Systems, 6th Edition, McGraw Hill Higher Education.
3. William Stallings, Computer Organization and Architecture: Designing for Performance, 10th Edition, Pearson Education.

Online Resources:

http://nptel.ac.in/courses/106103068/pdf/coa.pdf

Course Outcomes:

After completion of the course, students will be able to

1. Recognize the basic components and the design of CPU, ALU and Control Unit.
2. Know the architecture of 8086.
3. Realize the instruction set, instruction formats and addressing modes of 8086.
4. Write assembly language programs for problem solving.
5. Understand the memory hierarchy and I/O organization.
6. Comprehend the advantage of instruction level parallelism and pipelining for high performance Processor design.

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	L	T	P	C
II Year B.Tech. CSE (AI&ML) II-Semester				
Course Code: PC124BN	**3**	**-**	**-**	**3**

OPERATING SYSTEMS

(Common to CST, CSM & CSD)

Prerequisites: Data Structures using C

Course Objectives:

1. To understand the role of OS in the overall computer system and study the operations performed by OS as a resource manager.
2. To understand the scheduling policies and different memory management techniques for different operating systems.
3. To understand process concurrency and synchronization.
4. To understand the concepts of I/O, storage and file management and introduce system call interface for file and process management.
5. To introduce the goals and principles of protection.

UNIT 1: (~ 10 Lecture Hours)
Introduction: Overview-Introduction-Operating system objectives, User view, System view, Operating system definition, Computer System Organization, Computer System Architecture, OS Structure, OS Operations, Process Management, Memory Management, Storage Management, Protection and Security, Computing Environments.
Operating System services, User and OS Interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation, OS Structure.

UNIT 2: (~ 9 Lecture Hours)
Process: Process concepts-The Process, Process State, Process State transitions, Process Control Block, Context Switch.
Threads: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads.
Process Scheduling: Scheduling Queues, Schedulers, Scheduling Criteria, Scheduling algorithms, Multiprocessor Scheduling. Case Studies: Linux, Windows.

UNIT 3: (~ 10 Lecture Hours)
Process Synchronization: Inter-process Communication: Background, The Critical Section Problem, Race Conditions, Mutual Exclusion, Peterson's solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization- Bounded Buffer Problem, The Producer/ Consumer Problem, Reader's & Writer Problem, Dinning Philosopher Problem, Event counters, Monitors, Message passing.
Deadlocks: Deadlocks - System Model, Deadlock Characterization: Necessary and sufficient conditions for Deadlock, Methods for Handling Deadlocks: Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

UNIT 4: (~ 10 Lecture Hours)
Memory Management: Basic Hardware, Address Binding, Logical and physical address space, Dynamic loading, linking and Shared libraries, Swapping, Contiguous Memory Allocation- Fixed and variable partition–Internal and External fragmentation and

Compaction; Segmentation, Paging- Hardware support for paging, Protection, shared pages, Structure of Page Table. Case Studies: Linux, Windows.
Virtual Memory Management: Background, Demand Paging-locality of reference, Page fault; Copy-on-Write, Page replacement, Page Replacement Algorithms, Allocation of Frames, Thrashing.

UNIT 5: (~ 9 Lecture Hours)
File Management: Concept of File **-** Attributes, operations, file types, internal structure, access methods, Directory structure, file protection, file system structure, Allocation methods (contiguous, linked, indexed),Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.
Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk formatting- Boot-block, Bad blocks.
Protection: System Protection, Goals of Protection, Principles of Protection.

Text Books:
1. Abraham Silberschatz, Peter B.Galvin, Greg Gagne, Operating System Concepts, 9th Edition, Wiley Asia Student Edition.
2. William Stallings, Operating Systems: Internals and Design Principles, 5th Edition, Prentice Hall of India.

Reference Books:
1. Charles Crowley, Operating System: A Design-oriented Approach, 1st Edition, Irwin Publishing.
2. Gary J. Nutt, Addison, Operating Systems: A Modern Perspective, 2nd Edition, Wesley.
3. Maurice Bach, Design of the UNIX Operating Systems, 8th Edition, Prentice Hall of India.
4. Daniel P. Bovet, Marco Cesati, Understanding the Linux Kernel, 3rd Edition, O'Reilly and Associates.

Online Resources:
1. Abraham-Silberschatz-Operating-System-Concepts---9th 2012.12.pdf
2. https://www.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/

Course Outcomes:
After completion of the course, students will be able to
1. Acquire a High-level understanding of what is an operating system and the role it plays and the services it provides.
2. Understand process management concepts including scheduling, synchronization.
3. Describe System model for deadlock, Methods for handling deadlocks.
4. Understand memory management including virtual memory.
5. Acquire Knowledge on issues related to file system interface and implementation.
6. Understand the issues related to disk management.

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	L	T	P	C
II Year B.Tech. CSE (AI&ML) II-Semester				
Course Code: PC124AX	**3**	**1**	**-**	**4**

OBJECT ORIENTED PROGRAMMING

(Common to CST, CSM & CSD)

Prerequisites: Programming for Problem Solving

Course Objectives:

1. Learn the concepts of object oriented programming.
2. Introduce the implementation of inheritance, packages and interfaces.
3. Understand the concepts of exception handling and multithreading.
4. Introduce the java collection framework and I/O classes.
5. Gain knowledge in designing Graphical User Interface using applets and swing controls.

UNIT 1: (~ 8 Lecture Hours)
OOP concepts: Data abstraction, encapsulation, inheritance, polymorphism, classes and objects, Procedural and Object oriented programming paradigms.
Java Basics: History of Java, Java buzzwords, Data types, Variables, Arrays, operators, expressions, control statements, Introducing classes, Methods, Constructors, Inner classes, Anonymous Inner classes, String handling.

UNIT 2: (~ 10 Lecture Hours)
Inheritance: Inheritance concepts, Member access, Creating Multilevel hierarchy, using super, using final with inheritance, forms of inheritance, benefits of inheritance, costs of inheritance, Polymorphism-Adhoc polymorphism, pure polymorphism, method overriding, abstract classes, Object class.
Packages: Defining a Package, CLASSPATH, Access protection, importing packages.
Interfaces: Defining an interface, implementing interfaces, Nested interfaces, variables in interfaces and extending interfaces.

UNIT 3: (~ 10 Lecture Hours)
Exception handling: Fundamentals of exception handling, Exception types, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built-in exceptions, creating own exception sub classes.
Multithreading: Differences between thread-based multitasking and process-based multitasking, Java thread model, creating threads, thread priorities, synchronizing threads, inter thread communication.

UNIT 4: (~ 10 Lecture Hours)
Stream based I/O (java.io): The Stream classes - Byte streams and Character streams, Reading Console Input and Writing Console Output, File class, Reading and Writing files, Random access file operations, Generics, Enumerations.
The Collections Framework (java.util): Collections overview, Collection Interfaces, The Collection classes - ArrayList, LinkedList, Iterator, The For-Each alternative, HashTable, Properties, Stack, Vector, StringTokenizer, Calendar, Random, Scanner.

UNIT 5: (~ 10 Lecture Hours)
Event Handling: The Delegation Event Model - Events, Event sources, Event Listeners, Event classes, Handling mouse and keyboard events, Adapter classes.
GUI Programming with Swing: Introduction, limitations of AWT, MVC architecture, Swing components, Swing containers, Swing Controls - JLabel, JTextField, JButton, JToggleButton, JCheckBox, JRadioButton, JTabbedPane, JScrollPane, JList, JComboBox, Swing Menus, Dialogs. Layout Managers-FlowLayout, BorderLayout, GridLayout, CardLayout, GridBagLayout.
Applets: The Applet class, Difference between Applets and Applications, Life Cycle of an Applet, passing parameters to applets.

Text Books:
1. Herbert Schildt, Java: The Complete Reference, 9th Edition, McGraw Hill Education (India) Pvt. Ltd.
2. Herbert Schildt and Dale Skrien, Java Fundamentals - A comprehensive Introduction, McGraw Hill Education (India) Pvt. Ltd., 2013.

Reference Books:
1. Jaime Nino and Frederick. A. Hosch, An Introduction to Programming and Object Oriented Design using Java, John Wiley & sons, 2013.
2. Timothy Budd, Understanding Object-Oriented Programming with Java, updated Edition, Pearson Education.
3. Y. Daniel Liang, Introduction to Java Programming, Comprehensive Version, 7th Edition, Pearson Education.
4. P. Radha Krishna, Object Oriented Programming through Java, Universities Press, 2008.

Online Resources:
1. https://docs.oracle.com/javase/tutorial/java/TOC.html
2. www.javatpoint.com/java-tutorial

Course Outcomes:
After completion of the course, students will be able to
1. Understand the object oriented programming concepts and solve real world problems.
2. Demonstrate the use of inheritance and packages.
3. Understand and implement the concepts of exception handling.
4. Develop multithreaded applications with synchronization.
5. Solve problems using java collection framework and I/O classes.
6. Design Graphical User Interface using applets and swing controls.

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	L	T	P	C
II Year B.Tech. CSE (AI&ML) II-Semester				
Course Code: PC124NB	**3**	**-**	**-**	**3**

INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Prerequisites: Data Structures using C, Discrete Mathematics

Course Objectives:

1. To learn the difference between optimal reasoning vs human like reasoning.
2. To understand the notions of state space representation, exhaustive search, heuristic search.
3. To learn different knowledge representation techniques.
4. To understand the applications of AI like Game Playing and Expert Systems.
5. To Introduce the concept of Machine Learning

UNIT 1: (~ 10 Lecture Hours)
Introduction: History, Intelligent Systems, Foundations of AI, Sub areas of AI & Applications.
Problem Solving - State-Space Search and Control Strategies, General Problem Solving Techniques Characteristics of Problem, Exhaustive Searches, Heuristic Search Techniques, Iterative-Deepening A*, Constraint Satisfaction. Game Playing, Bounded Look-ahead Strategy and use of Evaluation Functions, Alpha-Beta Pruning.

UNIT 2: (~ 9 Lecture Hours)
Logic Concepts and Logic Programming: Introduction, Propositional Calculus, Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Tableau System in Propositional Logic, Resolution Algorithm, Predicate Logic, Logic Programming.

UNIT 3: (~ 10 Lecture Hours)
Knowledge Representation: Introduction, Approaches to Knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames.
Advanced Knowledge Representation Techniques: Case Grammars, Semantic Web

UNIT 4: (~ 10 Lecture Hours)
Uncertainty Measure - Probability Theory: Introduction, Probability Theory, Bayesian Belief Networks, Certainty Factor Theory, Dempster-Shafer Theory.
Introduction to Machine Learning: Machine Learning Systems, Supervised and unsupervised learning, Inductive and Deductive learning.

UNIT 5: (~ 10 Lecture Hours)
Expert System and Applications: Introduction, Phases in Building Expert Systems, Expert System Architecture, Expert Systems Vs Traditional Systems, Rule based Expert Systems, Truth Maintenance Systems, Applications of Expert Systems, List of Shells and Tools.

Text Books:

1. Saroj Kaushik, Artificial Intelligence, Cengage Learning, 2011.

Reference Books:

1. Rich, Knight, Nair: Artificial intelligence, Tata McGraw Hill, Third Edition, 2009.
2. Eugene Charniak, Introduction to Artificial Intelligence, Pearson, 2007.
3. Dan W.Patterson, Introduction to Artificial Intelligence and Expert Systems, PHI, 1990.
4. George Fluger, Artificial Intelligence, 5th Edition, Pearson.

Online Resources:

1. http://www.vssut.ac.in/lecture_notes/lecture1428643004.pdf
2. http://nptel.ac.in/courses/106105077/
3. https://onlinecourses.nptel.ac.in/noc18_cs18/preview
4. https://www.edx.org/course/artificial-intelligence-ai-columbiax-csmm-101x-4

Course outcomes:

After completion of the course, students will be able to

1. Understand the basics of AI and to formulate efficient problem space and select a search algorithm for a problem.
2. Apply AI techniques to solve problems related to Game playing, Expert systems.
3. Develop Logic programming skills.
4. Represent knowledge using appropriate techniques.
5. Interpret probabilistic and logical reasoning for knowledge.
6. Understand the concept of machine learning.

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	L	T	P	C
II Year B.Tech. CSE (AI&ML) II-Semester				
Course Code: PC12427	-	-	3	1.5

COMPUTER ORGANIZATION AND MICROPROCESSOR LAB

(Common to CSM & CSD)

Prerequisites: Digital Logic Design

Course Objectives:

1. Design and implement combinational circuits using logic gates.
2. Analyze and design sequential circuits using logic gates.
3. Write programs in Assembly language to solve the problems.
4. Understand, compile and debug the programs.

List of Experiments:

Week 1:

Implement the following experiments using Logic gates and IC's

a. Logic gates using universal gates.
b. Design a Full adder.
c. Design 4x1 and 8x1 MUX.

Week 2:

Implement the following experiments using Logic gates and IC's

a. Design a 3 to 8 decoder. b. Design a 4-bit comparator.

Week 3:

Implement the following experiments using Flip-flops

a. Design a 4-bit shift register. b. Design a decade counter.

Week 4:

Write an Assembly Language Program (ALP) to evaluate the expressions a=b+c-d*e and z=x*y+w-v+u/k. Considering 8-bit, 16-bit and 32-bit binary numbers as b, c, d, e, k, u, v, w, x and y.

Week 5:

Write an ALP of 8086 to take N numbers as input and arrange them in ascending and descending order.

Week 6:

Write an ALP of 8086 to take N numbers as input and do the following operations on them

a. Find maximum and minimum. b. Find average

Week 7:

Write an ALP of 8086 to take a string as input and do the following operations on it

a. Find the length. b. Find whether it is Palindrome or not.

Week 8:
Write an ALP of 8086 to take a string as input and find whether given string is substring or not.

Week 9:
Write an ALP of 8086 to take a number as input and find the factorial using a procedure call.

Week 10:
Write an ALP of 8086 to take a number as input and find the Fibonacci series up to n terms using a procedure call.

Week 11:
Write an ALP of 8086 for interfacing with Analog to Digital Converter.

Week 12:
Write an ALP of 8086 for interfacing with Digital to Analog Converter.

Text Books:
1. M. Morris Mano, Computer System Architecture, 3rd Edition, Pearson.
2. K. M Bhurchandi and A.K Ray, Advanced Microprocessors and Peripherals, 3rd Edition, Tata McGraw-Hill Education.

Reference Books:
1. Anand Kumar, Switching theory and logic design, 2013, PHI.
2. Douglas V. Hall, Microprocessor and Interfacing, 2nd Edition, Tata McGraw-Hill Education.

Online Resources:
http://nptel.ac.in/courses/106103068/pdf/coa.pdf

Course Outcomes:
After completion of the course, students will be able to
1. Design combinational circuits using logic gates.
2. Design sequential circuits using logic gates.
3. Recognize the representation of data, addressing modes and instructions sets.
4. Write and execute programs in Assembly language to solve the problems.
5. Compile and debug the programs.
6. Analyze and interface different peripherals with the microprocessor.

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	L	T	P	C
II Year B.Tech. CSE (AI&ML) II-Semester				
Course Code: PC12433	-	-	3	1.5

OPERATING SYSTEMS LAB

(Common to CST, CSM & CSD)

Prerequisites: Programming for Problem Solving, Data Structures using C

Course Objectives:

1. To write programs in Linux environment.
2. To implement the scheduling algorithms.
3. To develop solutions for synchronization problems using semaphores.
4. To implement page replacement algorithms and other memory management techniques.
5. To implement file allocation methods.

List of Experiments:

Use Linux operating system and GNU C compiler:

Week 1: Programs using system calls

a. Write a C program to simulate ls | sort command.
b. Write a C program to implement the Process system calls. Create a new process, create a child process to it and then make it wait and abort.
c. Write a C program to simulate copy the contents of one file to another using system calls.

Week 2: Write C programs to simulate the following CPU scheduling algorithms:

a. FCFS b. SJF

Week 3: Write C programs to simulate the following CPU scheduling algorithms:

a. Priority b. Round Robin

Week 4: Write a C program to solve the Producer- Consumer problem using semaphores.

Week 5: Write a C program to solve the Dining- Philosopher problem using monitors.

Week 6: Write a C program to simulate Bankers Algorithm for Dead Lock Avoidance.

Week 7: Write a C program to simulate Bankers Algorithm for Dead Lock Prevention.

Week 8: Write C program to simulate the paging technique of memory management.

Week 9: Write C program to simulate the segmentation technique of memory management.

Week 10: Write C programs to simulate the following page replacement algorithms:

a. FIFO b. LRU

Week 11: Write C programs to simulate the following Directory organization techniques:

a. Single level directory b. Two level directory

Week 12: Write C programs to simulate the following File allocation methods:
a. Contiguous b. Linked

Text Books:
1. Abraham Silberschatz, Peter Galvin and Greg Gagne, Operating System Concepts, 9th Edition, Wiley Asia Student Edition.
2. William Stallings, Operating Systems: Internals and Design Principles, 5th Edition, Prentice Hall of India.

Reference Books:
1. P.C.P Bhatt, An Introduction to Operating Systems, 2nd Edition, PHI.
2. Terrence Chan, Unix System Programming Using C++, PHI/ Pearson.
3. Andrew S Tanenbaum, Modern Operating Systems, 3rd Edition, PHI.

Online Resources:
1. http://codex.cs.yale.edu/avi/os-book/OS9/
2. www.cs.uic.edu/~jbell/CourseNotes/OperatingSystems

Course Outcomes:
After completion of the course, students will be able to
1. Design and solve synchronization problems.
2. Simulate and implement scheduling concepts.
3. Model a deadlock situation and implementing methods for handling deadlocks.
4. Simulate and implement memory management techniques.
5. Simulate and implement various file management concepts.
6. Use different system calls for writing application programs.

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	L	T	P	C
II Year B.Tech. CSE (AI&ML) II-Semester				
Course Code: PC12423	**-**	**-**	**3**	**1.5**

OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

(Common to CST, CSM & CSD)

Prerequisites: Programming for Problem Solving

Course Objectives:

1. Develop skills to apply object oriented programming in problem solving.
2. Demonstrate the use of inheritance and interfaces.
3. Implement the concepts of exception handling and multithreading.
4. Solve problems using java collection framework and I/O classes.
5. Write GUI programs using applets and swing controls.

Note: Use Linux for Lab Experiments. Though not mandatory, encourage the use of Eclipse platform.

List of Experiments:

Week 1:

Write a Java program that prints all real solutions to the quadratic equation $ax^2+bx+c=0$. Read in a, b, c and use the quadratic formula. If the discriminant b^2-4ac is negative, display a message stating that there are no real solutions.

Week 2:

a. Write a Java program that demonstrates constructor overloading.
b. Write a Java program to implement the use of inner classes.

Week 3:

a. Write a Java program to create an abstract class named 'Shape' that contains two integers and an empty method named printArea( ). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method printArea( ) that prints the area of the given shape.
b. Write a Java program that implements multiple inheritance.
c. Write a Java program that demonstrates method overriding.

Week 4:

a. Write a Java program that implements a multi-threaded application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
b. Write a Java program that implements producer – consumer problem using the concept of Inter thread communication.

Week 5:

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

b. Write a Java program for the following:
   i) Create a doubly linked list of elements.
   ii) Delete a given element from the above list.
   iii) Display the contents of the list after deletion.

Week 6:

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

Week 7:

a. Develop an applet that displays a simple message.
b. Develop an applet in java that receives an integer in one text field, and computes its factorial value and returns it in another text field, when the button named "Compute" is clicked.

Week 8:

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

Week 9:

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

Week 10:

Write a Java program that simulates a traffic light. The program lets the user select one of the three lights: red, yellow or green with radio buttons. On selecting a button, an appropriate message with "Stop" or "Ready" or "Go" should appear.

Week 11:

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

Week 12:

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

Text Books:

1. Herbert Schildt, Java- The Complete Reference, 9th Edition, McGraw Hill Education (India) Pvt. Ltd.
2. Paul Deitel and Harvey Deitel, Java- How to Program, Early Objects, 10th Edition, Pearson Education.

Reference Books:

1. Bruce Eckel, Thinking in Java, 3rd Edition, Pearson Education.
2. Cay S. Horstmann and Gary Cornell, Core Java, Volume 1-Fundamentals, 9th Edition, Pearson Education.

Online Resources:

1. http://docs.oracle.com/javase/tutorial/java/TOC.html
2. www.javatpoint.com/java-tutorial

Course Outcomes:

After completion of the course, students will be able to

1. Implement the concepts of object oriented programming to solve problems.
2. Develop programs using inheritance and interfaces.
3. Understand and implement the concepts of exception handling.
4. Develop multithreaded applications with synchronization.
5. Solve problems using java collection framework and I/O classes.
6. Develop GUI based applications using applets and swing controls.

G. NARAYANAMMA INSTITUTE OF TECHNOLOGY & SCIENCE
(For Women)

(AUTONOMOUS)
Shaikpet, HYDERABAD - 500 104

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II Year B.Tech. CSE (AI&ML) II-Semester				
Course Code: MC124BE	**2**	**-**	**-**	**-**

ENVIRONMENTAL SCIENCES
(Common to CST, CSM & CSD)
(Mandatory Course)

Prerequisites: -Nil-

Course Objectives:

1. Understanding the importance of ecological balance for sustainable development.
2. Understanding the impacts of developmental activities and mitigation measures.
3. Understanding the environmental policies and regulations.
4. Create awareness about environmental issues & identify the sustainable solutions.
5. To sensitize the young minds to wildlife environment.
6. To develop the knowledge on various environmental components and their interrelation with each other.

UNIT 1: (~ 5 Lecture Hours)
Ecosystems: Definition, Scope and Importance of ecosystem. Classification, structure and function of an ecosystem, food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Bio-magnification, ecosystem value, services and carrying capacity, Field visits.

UNIT 2: (~ 7 Lecture Hours)
Natural Resources: Introduction, Classification of Resources, Living and Non-Living resources, Water Resources**:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral Resources: use and exploitation, environmental effects of extracting and using mineral resources. Land Resources, Energy Resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT 3: (~ 6 Lecture Hours)
Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity, value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity, Field visit Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; Conservation of biodiversity: In-Situ and Ex-situ conservation.

UNIT 4: (~ 7 Lecture Hours)
Environmental Pollution and Control Technologies: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Sources and types of pollution, drinking water quality standards. Soil Pollution**:** Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management.

Global Environmental Problems and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS).

Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

UNIT 5: (~ 6 Lecture Hours)
Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, Hazardous Waste (Management and Handling) Rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP).
Towards Sustainable Future: Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building.

Text Books:
1. Erach Bharucha, Text book of Environmental Studies for Undergraduate Courses, University Grants Commission.
2. R. Rajagopalan, Environmental Studies, Oxford University Press.

Reference Books:
1. Richard T. Wright, Environmental Science: towards a sustainable future, PHL Learning Private Ltd. New Delhi, 2008.
2. Gilbert M. Masters and Wendell P. Ela, Environmental Engineering and science, PHI Learning Pvt. Ltd., 2008.
3. Daniel B. Botkin & Edward A. Keller, Environmental Science, Wiley INDIA Edition.
4. Anubha Kaushik, Environmental Studies, 4th Edition, New age international publishers.
5. Dr. M. Anji Reddy, Text book of Environmental Science and Technology, BS Publications, 2007.

Online Resources:
1. http://www.open.edu/openlearn/free-courses/full-catalogue
2. https://www.edx.org/course/subject/environmental-studies
3. https://www.mooc-list.com/tags/environmental-management
4. https://www.enviroblog.net

Course Outcomes:
After completion of the course, students will be able to
1. Benefited by various ecological principles and environmental regulations for sustainable development.
2. Able to identify/analyze/evaluate/demonstrate the consequences of developmental activities and mitigation measures.
3. Develop the advanced technologies in protection/conservation of resources in sustainable approach.
4. Improved in attitude & thinking of the students will be positively towards earth & environment.
5. Benefited by knowing the concepts like Green Buildings, Low Carbon Lifestyle, International conventions etc.
6. It helps the students to improve the quality of life.