ACADEMIC REGULATIONS
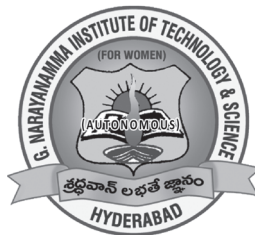
COURSE STRUCTURE

AND

DETAILED SYLLABUS

(I & II Years)

COMPUTER SCIENCE AND TECHNOLOGY

FOR

B.TECH FOUR YEAR DEGREE COURSE
(Applicable for the batches admitted from 2022-23)

G. Narayanamma Institute of Technology and Science

(for women)

(AUTONOMOUS)

Shaikpet, Hyderabad –500104.

DEPARTMENT OF
COMPUTER SCIENCE AND TECHNOLOGY

DEPARTMENT VISION

To build a prime transformative learning community that responds swiftly to the challenges of Information Technology

DEPARTMENT MISSION

To foster an intellectual environment that delivers virtuous Information Technocrats with commitment to industry and society by strengthening the logical, analytical and applicative skills to excel academically and professionally. To inculcate good communication skills in students and introduce them to various codes of professional practices for carrying out effective team collaborations and project management in the field of IT.

G. NARAYANAMMA INSTITUTE OF TECHNOLOGY & SCIENCE (for WOMEN)
(Autonomous)
Shaikpet, Hyderabad – 500 104

ACADEMIC REGULATIONS (R22)
For CBCS Based B.Tech. Degree Programmes

(Applicable for the students admitted into I year from the
Academic Year **2022-23** and onwards)

1.0   Under-Graduate Degree Programme (UGDP) in Engineering & Technology (E&T)

G. Narayanamma Institute of Technology & Science (GNITS) - for Women, Hyderabad, an Autonomous College approved by AICTE, New Delhi, and affiliated to Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, offers 4 Year (8 Semesters) **Bachelor of Technology** (B.Tech.) Degree Programme under Choice Based Credit System (CBCS) with effect from the Academic Year 2022 – 23 onwards in the following Branches of Engineering & Technology (Table 1.0) :

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

Table 1.0

2.0   Eligibility for Admission

2.1   The Admission to the UGDP 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 Programme in E&T shall be ENGLISH only.

3.0   B.Tech. Degree Programme Structure

3.1   The B.Tech. Degree Programmes 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 Clauses

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 UGDP is of 4 Academic Years (8 Semesters), with each academic year divided into two semesters of 22 weeks ($\geq$90 working days) each. Each semester has 2 components of evaluation - '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 refer to 'Theory Subject', or 'Lab/Practical Course', or 'Design/ Drawing Subject', or 'Elective', or 'Open Elective", or 'Seminar', or 'Project', or 'Mini-Project', or 'Online Course', 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.
- Mandatory Courses (MC) will not carry Credits.

3.2.3 Subject/ Course Classification

All the Subjects/ Courses offered for the UGDP are broadly classified as : (a) Foundation Courses (FnC), (b) Core Courses (CoC), and (c) Elective Courses (E*l*C).

- 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 (E*l*C) 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 (OL - offered on MOOCS platform by NPTEL/IITs) approved by JNTUH ;
  - MC - No Credits allocated.

3.2.4 Course Nomenclature:

The Curriculum Nomenclature or Course Structure Grouping for each UG Degree Programme (or B.Tech. Degree Course) is as listed below (along with AICTE specified % Range of Credits) in Table 3.2.4:

S. No.	Broad Course Classification	Course Group/ Category	Course Description	Range of Credits (AICTE Model)	R22 Regulations at GNITS
1)	Foundation Courses (FnC)	BS – Basic Sciences	Include - Mathematics, Physics, Chemistry, Biology Subjects	15% - 20%	22.5 C (14.06 %)
2)		ES - Engineering Sciences	Include fundamental engineering subjects	15% - 20%	25 C (15.63 %)
3)		HS – Humanities & Social Sciences	Include subjects related to Humanities, Social Sciences and Management	5% - 10%	12 C (7.5 %)
4)	Core Courses (CoC)	PC – Professional Core	Include core subjects related to the Parent Department/ Branch of Engg.	30% - 40%	54.5 C (34.06 %)
5)	Elective Courses (EℓC)	PE – Professional Electives	Include Elective subjects related to the Parent Department/ Branch of Engg.	10% - 15%	18 C (11.25 %)
6)		OE – Open Electives	Elective subjects include subjects from other Technical and/ or Emerging Subject Areas	5% - 10%	9 C (5.62 %)
7)	Projects Related Courses (PW)	Project Work	B.Tech. Project or UG Project or UG Major Project	10% - 15%	19 C (11.88 %)
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	No Credits	-
11)	Additional Courses	ONLINE Courses (OL)	Offered on MOOCS platform by NPTEL/ IITs	ADDI-TIONALs	24 C
Total Credits for UG (B. Tech.) Degree Programme				160 (100%)	160 (100%)

Table 3.2.4.

4.0 Course Work

4.1 A student after securing admission, shall pursue the B.Tech. UG Degree Programme 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 UGDP, 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 UGDP and Award of the B.Tech. Degree in the respective Branch of Engineering.

4.4 Each Semester is structured to provide 20 Credits (20 C), 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 UGDP, 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 (20 Credits) indicated in that semester workload of the respective UGDP Course Structure - this is termed as the 'Normal Work Load' (NWL).

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 (20 Credits) suggested in the respective semester credit load allocation of that UGDP Course Structure as the Normal Work Load (NWL), and the Maximum Work Load per semester (MWL) – with permissible additional courses within the Course Structure (subject to a maximum of 2 Theory Courses and 1 Lab Course) of her choice, is limited to a total work load of 28 Credits, 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/extra' Subjects/Courses to reach the Maximum Work Load (MWL) of 28 Credits (above the NWL specified) in each semester must be clearly indicated on a

request letter, which needs the specific approvals and signatures of the Faculty Advisor/ Counselor and the HoD on the hardcopy.

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 correctly 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 NWL), 'within 15 Days of Time' from the beginning of the current semester.

5.10 For the Mandatory Courses, 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 (including Mandatory or Non-Credit Courses) for that semester. Two periods of attendance for each theory subject shall be considered, if the student appears for the mid-term examination of that subject.

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.

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 gets detained and her registration for that semester shall stand cancelled. She will not be promoted to the next semester. She may seek re-registration for all those Subjects registered in that semester in which she got 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 available 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 (except for Seminar and Mini-Projects), if she secures not less than 35% (14 marks out of 40 marks) in CIE (Continuous Internal Evaluation), not less than 35% (21 marks out of 60 marks) in SEE (Semester End Examination), and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of Letter Grades, this implies securing **'C'** grade or above in that subject/ course.

8.2 A student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to the Seminar (IV Year II Semester) and the Mini-Projects (II Year II Semester, and III Year II Semester), if she secures not less than 40% of the total marks (that is, 40 out of 100 marks allotted) for each of them. The student would be treated as failed, if she - (i) does not submit a report on her Mini-Projects, or does not make a presentation of the same before the Evaluation Committee as per specified schedule, or (ii) does not present the Seminar as required in the IV year II Semester, or (iii) secures less than 40% of marks (that is, 40 marks) in the Mini-Projects/ Seminar evaluations. She may reappear once for each of the Mini-Projects/ Seminar evaluations, as and when they are scheduled again; 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 20 Credits out of 40 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 48 Credits out of 80 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 72 Credits out of 120 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 - (i) 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, (ii) puts up all the Attendance and Academic requirements for 160 Credits securing a minimum of C Grade (Pass Grade) or above in each Subject, (iii) earns ALL 160 Credits securing SGPA ≥ 5.0 (in each semester), and CGPA (at the end of each successive semester) ≥ 5.0, and (iv) satisfactorily completes all Mandatory Courses; to successfully complete the UG Degree Programme. **THERE IS NO EXEMPTION OF CREDITS IN ANY CASE**

8.7 B.Tech. Degree Programme with HONORS/ MINOR DEGREE in EMERGING AREAS as per AICTE Norms and JNTUH Specifications (with effect from 2022-23 Academic Year) :

a) GNITS offers B.Tech. Degree Programme with HONORS in CSE Branch of CSE Department, with the JNTUH stipulated Regulations and Eligibility Conditions. Accordingly, students need to acquire 20 additional Credits in specified subjects offered from identified Emerging Areas during III Year and IV Year, for HONORS specialization in the same Major Discipline/ Branch of Engineering.

The Academic Regulations, Eligibility Conditions, Registration and other details are listed in Annexure-H (enclosed).

b) GNITS offers B.Tech. Degree Programmes with MINOR DEGREE in the following Emerging Areas – (i) Artificial Intelligence & Machine Learning (AI & ML), (ii) Cyber Security (CS), (iii) Data Science (DS), (iv) Internet of Things (IoT), v) Advanced Web Development (AWD – under AICTE-LITE Programme - Online), with the JNTUH specified Regulations and Eligibility Conditions. Accordingly, students need to acquire 18 additional Credits in specified subjects offered from identified Emerging Areas, during III Year and IV Year, for MINOR DEGREE specialization from other Departments/Branches of Engineering.

The Academic Regulations, Eligibility Conditions, Registration and other details are listed in Annexure-M (enclosed).

c) Students who opt for the above HONORS/ MINOR DEGREE Programmes should not have any backlogs, as per JNTUH stipulations (details listed in Annexures - H and M).

d) If the student fails to get the JNTUH stipulated number of Credits (18 for Minor Degree and 20 for Honors) within 4 years from the date of commencement of their UGDP, then they shall get only the B.Tech. Degree with the Major Engineering Branch Specialization in which they were admitted in I Year, subject to completion of the required 160 C (as per NWL). All the other Credits they have acquired (beyond this 160 C) shall only be listed as 'Additional Subjects/ Courses chosen' in the Marks Memo along with the Grade obtained. The performances in these 'Additional Subjects' shall not be taken into account while calculating the SGPA and CGPA of the B.Tech. Degree Programme.

e) If a student takes prior permission and registers for any 'Additional Subjects' (in the parent Department or other Departments/Branches of Engg.) other than those listed Subjects totalling to 160 Credits as specified in the Course Structure of her Department, without HONORS/

MINOR DEGREE considerations (as listed above), the performances in those 'Additional Subjects' (although evaluated and graded) shall not be taken into account while calculating the SGPA and CGPA of the B.Tech. Degree Programme. For such 'Additional Subjects' registered, the % of marks and/or the Letter Grade alone may be indicated in the Marks Memo 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 admissions 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 fulfilment 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 (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.

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 Engineering Graphics/ Engineering Drawing, or Elective Course, or Mini-Projects, or Seminar, or Project – I (Phase – I), or Project – II (Phase – II) etc. These evaluations shall be based on 40% CIE (Continuous Internal Evaluation) and 60% SEE (Semester End Examination) basis, 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: 40 Marks for the CIE and 60 Marks for the SEE for the entire UG Degree Programme.

9.3 a) For the Theory Subjects during the semester, the CIE assessment for 40 marks includes two Mid-Term Examinations. Each Mid-Term Examination is conducted for 30 marks, for a duration of 120 minutes, and it shall have two parts : i) Part-A (Objective/Quiz Paper) for 10 marks, and ii) Part-B (Descriptive Paper) for 20 marks. Average of these two Mid-Term Examinations is assessed for 30 marks.

The Objective/Quiz Paper is set with ten multiple choice/ fill-in the blanks/ match the following … type of questions for a total of 10 marks. The Descriptive Paper (for 20 marks) shall contain 6 full questions, out of which, the student has to answer 4 questions, each carrying 5 marks.

The remaining 10 marks of CIE are distributed as - i) 5 marks for Assignment (average of 2 Assignments submitted, each for 5 marks), and ii) 5 marks for - Subject Viva-voce/ PPT/ Poster Presentation/ Case Study on a topic in the concerned subject.

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) There shall be 2 Assignments per semester, and 5 marks are allocated for each Assignment. 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 concerned subject teacher, and the Average of these two Assignments shall be taken into account for 5 marks.

d) Assessment (for 5 marks) for the Subject Viva-voce/ Poster Presentation/ Case Study on a topic in the subject concerned shall be carried out before the commencement of II Mid-Term Examinations.

e) Sum of these three components of marks - (i) Average of the two Mid-Term Examinations marks (for 30 marks), (ii) Average of the two Assignments marks (for 5 marks), and (iii) the Assessment for the Subject Viva-voce/ Poster Presentation/ Case Study on a topic in the subject concerned (for 5 marks) – shall be the final marks secured towards the CIE (40 marks) in that Subject/ Course. The student has to earn a minimum of 35 % (14 marks) out of these 40 marks allocated.

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

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

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

f) 60 marks are allocated for Semester End Examination (SEE), which is of 3 hours duration. The SEE Question Paper will have two parts : i) Part-A is for 10 marks and is compulsory - it consists of 10 questions of 1 mark each (2 questions from each unit); and ii) Part-B is for 50 marks – it consists of 5 questions of 10 marks each (one question from each unit, it may contain sub-questions); for each question there will be 'either/ or' choice, which means that there will be two questions from each unit and the student should answer one of these two.

9.4 For the Lab/Practical Subjects also, the Continuous Internal Evaluation (CIE) during the semester shall be for 40 Marks, and the End Semester Examination (SEE) shall be for 60 Marks. Out of the 40 Marks for internals (CIE), day-to-day assessment of the lab work shall be judged for 20 Marks; and one internal lab exam shall be conducted by the laboratory teacher concerned for 20 Marks, out of which 10 Marks are allocated for the viva-voce. 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.

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

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

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

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: 40 Marks for CIE (20 Marks for the day-to-day work and 20 Marks for the internal test) and 60 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 from the internal tests for CIE.

9.6 Open Electives (OE) : 3 Open Elective Courses shall be offered in the 8 Semester UG Degree Programme. Students are to choose each Open Elective, from the set of options given, in 3 different semesters (in III and IV Years). The students have to choose three Open Electives (OE1, OE2, OE3) from the list of Open Electives given by other departments. However, the student can opt for an Open Elective subject offered by her own (parent) department, if she has not registered that subject under any category (Professional Core, Professional Electives, Mandatory Courses etc.) offered by parent department in any semester. Open Elective subjects already studied should not repeat/should not match with any category (Professional Core, Professional Electives, Mandatory Courses etc.) of subjects even in the forthcoming semesters.

9.7 There shall be a Seminar Presentation in the IV 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 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 two Mini-Projects – first one (Mini-Project 1 or MP1) will be during II Year II Semester (also termed Real Time Project, based on Laboratory Experiments and Teachers' advice); and the second one (Mini-Project 2 or MP2) is preferably in collaboration with an Industry with the relevant specialization (Industry Oriented Mini-Project), to be registered immediately after II Year II Semester examinations, and taken up during the summer vacation (between II and III Years) for about eight weeks duration. Students also have an option to choose Industry Internship (instead of Industry Oriented Mini-Project) for MP2, if they secure selection at any reputed Industry.

b) The Mini-Project Work shall be submitted in a Report form, and a presentation of the same shall be made before a Committee, which is evaluated for 100 marks by the Committee. The Committee shall consist of - 1) Head of the Department (for MP2) / a Professor of the Department (for MP1), 2) the Supervisor of Mini-Project, and 3) External Examiner (for MP2) / a Senior Faculty Member of the Department (for MP1). There shall be no internal marks for Mini-Projects. Performance evaluation of MP1 and MP2 shall be included in the II Year II Semester Grade Card and III Year II Semester Grade Card, respectively. The External Examiner for MP2 shall be nominated by the Principal from the panel of 3 names of external faculty members (Professors or Associate Professors outside the College) submitted by the Head of Department. Performance Evaluations of MP1 and MP2 Mini-Projects will be included in the II Year – II Semester, and III Year – II Semester Grade Cards, respectively.

c) Industry Internship (for MP2, in place of collaborative Mini-Project) is exclusively meant for those students who have been considered eligible and selected accordingly by the Industry. Based on such selection letters from Industry, approvals will be given to students by the Principal of the Institution to carry out the Industry Internship for the specified period. The work performed during the Internship and the outcomes shall be reported in a Report form, which will also be evaluated in the same format (same as that of MP2 as stated in 9.8 b above).

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, 40 marks shall be for the CIE (Continuous Internal Evaluation/CIE), and 60 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 and her presentations at the Project Review Committee (PRC) Meetings in the Department, during the two Project Work Phases/periods. The PRC shall be constituted by the Head of the Department, and shall consist of the Head of the Department (HoD), Project Supervisor, and a Senior Faculty Member of the Department. The PRC shall monitor and review the progress of the Project Work, based on the PRC presentations and performance evaluations. 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 the Semester End Examinations, at the Department Level by the Project (Phase – I) Evaluation Committee comprising of HoD or One Professor (nominated by the HoD), Supervisor (no External Examiner).

d) For the Project Phase – II Viva-voce (or Final Project Viva-voce) shall be conducted by a Project (Phase -II) Evaluation Committee comprising of an External Examiner, HoD and the Project Supervisor at the end of the IV Year II Semester, before the commencement of the Semester End Examinations. The External Examiner shall be nominated by the Principal from the panel of 3 names of external faculty members (Professors or Associate Professors outside the College) submitted by the HoD.

e) The student would be treated as failed, if she - (i) does not submit a Report on her Projects (Phase – I or Phase – II), or does not make a presentation of the same before the Evaluation Committee as per specified schedule, or (ii) secures less than 40% of marks (that is, 40 marks) in the sum total of the CIE and SEE taken together, in her Projects evaluations. She may reappear once for each of the Projects evaluations, as and when they are scheduled again; 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.

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

9.11 ONLINE Courses (OL) – offered on MOOCs platform (by NPTEL/IITs) : Provision is made to offer some identified Courses, PEs and OEs (or their nearest equivalent courses, along with the number of credits and period of duration, as notified by the HoD) over 'ONLINE' mode, in addition to the conventional 'OFFLINE' mode (regular class-room teaching), from III Year onwards. Students may choose any mode out of these two, within one week from the commencement of the current semester; however, for ONLINE mode choice, prior intimation and approval from the Head of the Department and Principal is necessary. If any student wishes to discontinue the ONLINE mode, she can switch back to OFFLINE mode with prior intimation to the Head of Department, preferably within 2 weeks from the beginning of the current semester. Prior to Registration of these ONLINE Courses (on MOOCS platform – offered by NPTEL/IITs), formal approval of the Courses by JNTUH is essential. On successful completion of the ONLINE Course, the performance Grade – based on the certification from the 'MOOCS Course Conducting Authorities' (NPTEL/IITs), will be appropriately awarded to the student and the same will be recorded on her Grade Card.

9.12 a) If the internal marks secured by a student in CIE in any theory subject are less than 35% (14 marks out of 40), but fulfilled the attendance requirements, she may be permitted to reappear once for the mid-term examination in each of the subjects, as and when it is rescheduled (within the same semester). The syllabus coverage for this one-time reappearance examination shall be the entire syllabus of that subject in the same semester; and the marks secured in this examination shall be treated as - component (i) of 9.3 (e) Clause, the other two components remaining the same as before. Altogether, she should secure at least 35% marks in CIE (14 out of the 40 marks allotted), to which marks earned in SEE will be added for declaration of Grade in that subject (as per Clause 8.1).

b) A student shall be given one time chance to re-register for a maximum of two theory subjects … if the internal marks secured by her in CIE (Continuous Internal Evaluation) are less than 35% (14 marks out of 40) and failed in those subjects, but fulfilled the attendance requirements. A student must re-register for such failed subject(s) within two weeks of commencement of the class work in the next academic year, and write all related examinations (including SEE) as listed in Clause 9.3. In the event of the student taking this chance, her CIE marks for 40 and SEE marks for 60 obtained in the previous attempt stand cancelled. Also, the student has to earn a minimum of 35% marks (14 marks out of 40) in her CIE now, to which marks earned in the current SEE will be added for declaration of Grade in that subject (as per Clause 8.1).

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 (Table 10.2) 'Letter Grades and corresponding percentage of marks' shall be followed:

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

Table 10.2

10.3 The Grade Designations include 7 categories, namely … O, A+, A, B+, B, C and F .

10.3.1 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 later. In such cases, her Internal Marks (CIE Marks) in those Subject(s) will remain the same as those obtained earlier.

10.3.2 If a student fails to appear for SEE of any Subject (s) for any reason whatsoever, she is deemed to have 'failed', and she will get F Grade in all such failed Subject (s). She will be required to reappear as 'Supplementary Candidate' in the End Semester Examination (SEE), as and when conducted later. In these cases also , 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) x 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

$$\text{SGPA} \; = \; \{\textstyle\sum_{i=1}^{N} C_i\, G_i\} \,/\, \{\textstyle\sum_{i=1}^{N} C_i\} \; \dots \; \textbf{for each semester}$$

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

$$\text{CGPA} \; = \{\textstyle\sum_{j=1}^{M} C_j\, G_j \,\} \,/\, \{\, \textstyle\sum_{j=1}^{M} C_j \; \} \; \dots \quad \textbf{for all S semesters registered}$$

$$\textbf{(ie., upto and inclusive of S semesters, } S \geq 2 \textbf{)},$$

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 SGPA and CGPA of a semester will be mentioned in the Semester Grade Card or Grades Memorandum, if all the subjects of that semester are passed in first attempt. Otherwise, the SGPA and CGPA shall be mentioned on the Grade Card, only when the student passes all subjects of that semester.

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.

    10.12.2 A 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 Programme) is required, then the following formula may be used as an estimate.

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

12.0 Award of Degree

12.1 a)   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 Programme, and secures the required number of 160 Credits (with Final CGPA $\geq$ 5.0), within 8 Academic Years from the Date of Commencement of the First Academic Year, shall be declared to have 'QUALIFIED' for the Award of the B.Tech. Degree in the chosen Branch of Engineering as selected at the time of Admission.

b)   B.Tech. with Honors/ Minor Degree shall be awarded by JNTUH to those successful and acquired 20 Credits (for Honors) and 18 Credits (for Minors) in addition to the stipulated 160 Credits for B.Tech. Degree, as per norms listed Clause 8.7 and Annexures H-M.

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

AWARD OF CLASS BASED ON FINAL CGPA (at the end of the UG Degree Programme)

First Class with Distinction	Final CGPA 8.00 or more ##
First Class	Final CGPA below 8.00 but not less than 7.00
Second Class	Final CGPA below 7.00 but not less than 6.00
Pass Class	Final CGPA below 6.00 but not less than 5.00

Table 12.2

Note :

a)   A student with Final CGPA (at the end of the UG Degree Programme) $\geq$ 8.00, and fulfilling the following conditions -

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

(ii) 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'.

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

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

c)   A student with Final CGPA (at the end of the UG Degree Programme) < 5.00 will not be eligible for the Award of the Degree.

12.3 Award of 2-Year Diploma Certificate

A student is awarded a 2-Year Diploma Certificate in the concerned engineering branch, on completion of all the academic requirements and earned all the 80 credits upto B.Tech. II Year, II Semester (within 4 years from the date of admission), if she wants to exit the 4 Year B.Tech. Degree Program. The student once opted and awarded the 2-Year UG Diploma Certificate, she will not be permitted - to join the B.Tech. III Year I Semester and continue for completion of remaining years of study for the 4 Year B.Tech. Degree.

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 Programme after the UGDP 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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ANNEXURE - H :

H1)   JNTUH stipulated Regulations for B.Tech. Degree Course with Honors :

H1.1 Academic Regulations :

a)   The weekly instruction hours, internal & external evaluation and award of grades are on par with regular 4-Years B. Tech. program.

b)   For B. Tech with Honors program, a student needs to earn additional 20 credits (over and above the required 160 credits for B. Tech degree). The broad guidelines for the courses of Honors program, their respective credits weightage and semester-wise break-up of the course are enclosed below in Clause H1.4 . All these 20 credits need to be completed in III year and IV year only.

c)   After registering for the Honors program, if a student is unable to pass all courses in first attempt and earn the required 20 credits, she shall not be awarded Honors degree. However, if the student earns all the required 160 credits of B. Tech., she will be awarded only B. Tech degree in the concerned branch.

d)   There is no transfer of credits from courses of Honors program to regular B. Tech. degree course & vice versa.

e)   These 20 credits are to be earned from the additional courses offered by the host department in the college or from a closely related departments in the college as well as from the MOOCS platform.

f)   For the courses selected under MOOCS platform following guidelines may be followed:

   i)   Prior to registration of MOOCS courses, formal approval of the courses, by the University is essential. University before the issue of approval considers the parameters like the institute / agency which is offering the course, syllabus, credits, duration of the programme and mode of evaluation etc.

   ii)   Minimum credits for a MOOCS course must be equal to or more than the credits specified in the Honors course structure provided by the University.

   iii)   Only Pass-grade/marks or above shall be considered for inclusion of grades in the Honors grade memo.

   iv)   Any expenses incurred for the MOOCS courses are to be met by the students only.

g)   The choice to opt/take the Honors program is purely on the choice of the students.

h)   The student shall be given a choice of withdrawing all the courses registered and/or the credits earned for Honors program at any time; and in that case the student will be awarded only B. Tech. degree in the concerned branch on earning the required credits of 160.

i)   The students of every branch can choose Honors program in their respective branches if they are eligible for the Honors program. A student who chooses an Honors program is not eligible to choose a Minor program and vice-versa.

j)   The B. Tech. with Honors program shall be offered at GNITS (W) from the AY 2022-23 onwards. The students who are pursuing their III year I semester in the current academic year can register for the Honors program if they fulfil the eligibility criteria.

k)   A student can graduate with Honors if she fulfils the requirements for her regular B. Tech. program as well as fulfils the requirements for Honors program.

l) The institute shall maintain a record of students registered and pursuing their Honors programs branch-wise. The same report needs to be sent to the University once the -enrolment process is complete.

m) The department shall prepare the time-tables for each Honors program offered at their respective departments without any overlap/clash with other courses of study in the respective semesters.

H1.2 Eligibility conditions of the students for the Honors degree :

a) A student can opt for B.Tech. degree with Honors, if she passed all subjects in first attempt in all the semesters till the results announced and maintaining 7.5 or more CGPA.

b) If a student fails in any registered course of either B. Tech. or Honors in any semester of four years program, she will not be eligible for obtaining Honors Degree. She will be eligible for only B. Tech. degree.

c) Prior approval of mentor and Head of the Department for the enrolment into Honors program, before commencement of III year I Semester (V Semester), is mandatory.

d) If more than 30% of the students in a branch fulfil the eligibility criteria (as stated above), the number of students given eligibility should be limited to 30%. The criteria to be followed for choosing 30% candidates in a branch may be the CGPA secured by the students till II year I semester.

e) The department concerned should be preferably NBA accredited and shall offer at least one M. Tech. Program.

f) Successful completion of 20 credits earmarked for Honors program with atleast 7.5 CGPA along with successful completion of 160 credits earmarked for regular B. Tech. Program with at least 7.5 CGPA and passing all subjects in first attempt gives the eligibility for the award of B. Tech. (Honors) degree.

g) For CGPA calculation of B. Tech. course, the 20 credits of Honors program will not be considered.

H1.3 Registration for the course in Honors Program :

a) At the beginning of each semester, just before the commencement of classes, students shall register for the courses which they wish to take in that semester.

b) The students should choose a course from the list against each semester (from Honors course structure) other than the courses they have studied/registered for regular B.Tech. programme. No course should be identical to that of the regular B. Tech. course. The students should take the advice of faculty mentors while registering for a course at the beginning of semester.

c) The maximum No. of courses for the Honors is limited to two (three in case of inclusion of lab) in a semester along with regular semester courses.

d) The registration fee to be collected from the students by the College is Rs. 1000/- per one credit.

e) A fee for late registration may be imposed as per the norms.

H1.4 Academic Regulations/ Course Structure for Honors degree in B. Tech. Programs (Table H1.4) **:**

S. No.	Year/ Semester	Course to be Chosen From/ Studied	Mode of Learning	No. of Credits
1	III-1	PE1 OR PE2	Blended/ Conventional	3
2	III-2	Research Methodologies	Conventional	3
3	III-2	PE3	Conventional	3
4	IV-1	PE4	Conventional	3
5	IV-1	PE5	Conventional	3
6	IV-2	Technical Paper Writing	Under the Mentorship of a Supervisor	2
7	IV-2	PE6 or an Inter-disciplinary Subject as suggested by University	MOOCS	3
		TOTAL CREDITS		20

Table: H1.4

Notes:

A) Professional Elective (PE) course should be selected (which is not studied) from each Professional Electives list provided in regular B. Tech. course.

B) Courses can be chosen as in above table.

C) **Technical paper writing:**

a) The student shall take up a problem/topic of engineering branches (inter-disciplinary nature) and apply the knowledge which she acquired while pursuing their engineering branch. It is expected to analyse, design and develop an application for the identified problem and write a technical paper/ document.

Alternatively, the student - i) shall identify a research topic, analyse the problem, carryout the experiments, write a technical paper and publish in /communicate for a Scopus indexed journal/any journal with decent reputation, or ii) demonstrate a talent/an idea/development of an innovative product.

b) The evaluation shall be done by the same committee which is constituted for project evaluation, along with the final semester project work.

c) The students should start exploration for the Technical Paper Writing immediately after the semester exams of III-II semester. Only the evaluation part shall be carried in IV-II semester.

D) The institute shall offer a course on Research Methodologies by combining the students of all branches (if the number of students is more, multiple parallel sessions may be conducted). The time slots in the time-tables of respective branches should be aligned. The external evaluation of Research Methodologies course shall be done by the University.

E) If the blended course option is chosen, for the subject in III-I semester, the learning should be partially in online mode and partially in offline mode. The external evaluation shall be done by the University; however, for the internal evaluation component, online assessment should also be taken into account while finalising the internal marks by the course teacher.

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ANNEXURE - M :

M1)   JNTUH stipulated Regulations for B.Tech. Degree Course with Minors :

M1.1 Minor Courses and the Offering Departments (Table M1.1) **:**

S. No.	Minor Programme	Eligible Branches of Students	Offering Departments @	Award of Degree
1	Artificial Intelligence & Machine Learning	All Branches, except B.Tech. in CSE (AI & ML)/ B.Tech. (AI & ML)/B.Tech. (AI)/ B.Tech. CSE (AI)	CSE	B.Tech. in Branch Name with Minor in Artificial Intelligence & Machine Learning
2	Cyber Security	All Branches, except B.Tech. in CSE (Cyber Security)/ B.Tech. (Cyber Security)	CSE	B.Tech. in Branch Name with Minor in Cyber Security
3	Data Science	All Branches, except B.Tech. in CSE (Data Science)/ B.Tech. (Data Science)	CSE	B.Tech. in Branch Name with Minor in Data Science
4	IOT	All Branches, except B.Tech. in CSE (IOT)/ B.Tech. (IOT)	ECE	B.Tech. in Branch Name with Minor in IOT
5	Innovation and Entrepreneurship	All Branches	Management Science/ MBA	B.Tech. in Branch Name with Minor in Innovation and Entrepreneurship

@ as per AICTE guidelines.

Table M1.1

M1.2 Academic Regulations for B. Tech. Degree with Minor Programs :

a)   The weekly instruction hours, internal & external evaluation and award of grades are on par with regular 4-Years B. Tech. program.

b)   For B. Tech. with Minor, a student needs to earn additional 18 credits (over and above the required 160 credits for B. Tech degree). The list of courses of each Minor program, their respective credits weightage and semester-wise break-up of the courses are as specified by JNTUH authorities. All these 18 credits need to be completed in III year and IV year only.

c)   After registering for the Minor programme, if a student is unable to earn all the required 18 credits in a specified duration (twice the duration of the course), she shall not be awarded Minor degree. However, if the student earns all the required 160 credits of B.Tech., he/she will be awarded only B. Tech degree in the concerned branch.

d)   There is no transfer of credits from Minor program courses to regular B. Tech. degree course & vice versa.

e)   These 18 credits are to be earned from the additional Courses offered by the host department in the college as well as from the MOOCS platform.

f)   For the course selected under MOOCS platform following guidelines may be followed:

   i)   **Prior to registration of MOOCS courses, formal approval of the courses, by the University is essential.** University, before the issue of approval, considers the parameters like the Institute / Agency which is offering the course, syllabus, credits, duration of the programme and mode of evaluation etc.

   ii)   Minimum credits for MOOCS course must be equal to or more than the credits specified in the Minor course structure provided by the University.

   iii)   Only Pass-grade/marks or above shall be considered for inclusion of grades in Minor grade memo.

   iv)   Any expenses incurred for the MOOCS courses are to be met by the students only.

g)   The choice to opt/take a Minor program is purely on the choice of the students.

h)   The student shall be given a choice of withdrawing all the courses registered and/or the credits earned for Minor program at any time; and in that case the student will be awarded only B. Tech. degree in the concerned branch on earning the required credits of 160.

i)   The student can choose only one Minor program along with her basic engineering degree. A student who chooses an Honors program is not eligible to choose a Minor program and vice-versa.

j)   The B. Tech. with a Minor program shall be offered from the AY 2021-22 onwards. The students who are pursuing their III year I semester in the current academic year can register for the Minor program if they fulfil the eligibility criteria.

k)   A student can graduate with a Minor if she fulfils the requirements for her regular B. Tech. program as well as fulfils the requirements for Minor program.

l)   The Institute shall maintain a record of students registered and pursuing their Minor programs, minor program-wise and parent branch-wise. The same report needs to be sent to the University once the enrolment process is complete.

m)   The Institute / Department shall prepare the time-tables for each Minor course offered at their respective institutes without any overlap/clash with other courses of study in the respective semesters.

M1.3 Eligibility conditions for the student to register for Minor Course :

a)   A student can opt for B.Tech. degree with Minor program if she/he has no active backlogs till II Year I Semester (III semester) at the time of entering into III year I semester.

b)   Prior approval of mentor and Head of the Department for the enrolment into Minor program, before commencement of III year I Semester (V Semester), is mandatory.

c)   If more than 50% of the students in a branch fulfil the eligibility criteria (as stated above), the number of students given eligibility should be limited to 50%.

M1.4   Registration for the courses in Minor Program :

a)   At the beginning of each semester, just before the commencement of classes, students shall register for the courses which they wish to take in the that semester.

b)   The students should choose a course from the list against each semester (from Minors course structure) other than the courses they have studied/registered for regular B.Tech. programme. No course should be identical to that of the regular B.Tech course. The students should take the advice of faculty mentors while registering for a course at the beginning of semester.

c)   The maximum No. of courses for the Minor is limited to two (three in case of inclusion of lab) in a semester along with regular semester courses.

d)   The registration fee to be collected from the students by the College is Rs. 1000/- per one credit.

e)   A fee for late registration may be imposed as per norms.

G. NARAYANAMMA INSTITUTE OF TECHNOLOGY & SCIENCE (for WOMEN)
(Autonomous)
Shaikpet, Hyderabad – 500104
ACADEMIC REGULATIONS (R22)

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

(Applicable for the students admitted into II year from the
Academic Year **2023-24** and onwards)

A)   **Eligibility for Admission ~**

A.1 The Admission to the B.Tech. Programme (UG Degree Programme) 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 Programme in the previous year); and their UGDP 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 Programme 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 (120 Credits) required for the completion of the UGDP 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 40 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 80 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 120 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 120 Credits securing a minimum of C Grade (Pass Grade) or above in each Subject, and earns ALL 120 Credits securing   SGPA ≥ 5.0 (in each semester), and CGPA (at the end of each successive semester) ≥ 5.0, to successfully complete the B.Tech. Degree Programme.

C.4 A student who fails to earn 120 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 Programme), 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 Programme, and secures the required number of 120 Credits (with final 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 (Table D.2) :

AWARD OF CLASS BASED ON FINAL CGPA (at the end of the UG Degree Programme)

First Class with Distinction	Final CGPA 8.00 or more ##
First Class	Final CGPA below 8.00 but not less than 7.00
Second Class	Final CGPA below 7.00 but not less than 6.00
Pass Class	Final CGPA below 6.00 but not less than 5.00

Table D.2

Note

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

(i)   should have passed all the Subjects/ Courses within the first 3 Academic Years (or 6 Sequential Semesters) from the Year of Admission,

(ii)   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'.

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

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

c) A student with Final CGPA (at the end of the UG Degree Programme) < 5.00 will not be eligible for the Award of the Degree.

E) Other Regulations ~

All the Academic Regulations as applicable for the B.Tech. 4 Year (Regular) Degree Programme 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.

F) LES Students are not eligible for the 2-Year UG Diploma Certificate (that provision is available for the Regular 4 Year B.Tech. Course Students only).

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

7.	Leaves the exam hall taking away answer script or intentionally tears 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 university 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 alreadyappeared 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 andproject 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 university for further action to award suitable punishment.	

B.Tech. 4 Year (8 semesters) Regular Programme in
COMPUTER SCIENCE AND TECHNOLOGY
Course Structure
(Applicable for the Batch admitted from the Academic Year 2022-23)

I YEAR   **I SEMESTER**

S.No.	Group	Sub Code	Subject	L	T	P	Credits
1	BS	121AA	Applied Chemistry	3	0	0	3
2	BS	121AB	Applied Physics	3	0	0	3
3	BS	121AG	Linear Algebra and Multivariable Calculus	3	1	0	4
4	ES	121AH	Programming for Problem Solving	3	0	0	3
5	HS	121AF	English for Skill Enhancement	2	0	0	2
6	BS	12101	Applied Chemistry Lab	0	0	2	1
7	BS	12102	Applied Physics Lab	0	0	3	1.5
8	ES	12108	Programming Lab	0	0	3	1.5
9	HS	12105	English Language and Communication Skills Lab	0	0	2	1
10	MC	12107	Gender Sensitization	0	0	2	-
			TOTAL	**14**	**1**	**12**	**20**

I YEAR   **II SEMESTER**

S.No	Group	Sub Code	Subject	L	T	P	Credits
1	BS	122AK	Numerical Techniques and Transform Calculus	3	1	0	4
2	ES	122AJ	Data Structures	3	0	0	3
3	ES	122AC	Basic Electrical Engineering	3	0	0	3
4	ES	122AE	Engineering Graphics	1	0	3	2.5
5	ES	12204	Engineering Workshop	1	0	3	2.5
6	ES	12209	Data Structures Lab	0	0	3	1.5
7	ES	12203	Basic Electrical Engineering Lab	0	0	3	1.5
8	ES	122AD	Design Thinking	2	0	0	2
9	MC	12206	Environmental Science and Technology	2	0	0	-
			TOTAL	**15**	**1**	**12**	**20**

B.Tech. 4 Year (8 semesters) Regular Programme in
COMPUTER SCIENCE AND TECHNOLOGY
Course Structure
(Applicable for the Batch admitted from the Academic Year 2022-23)

II YEAR   **I SEMESTER**

S.No.	Group	Sub Code	Subject	L	T	P	Credits
1	BS	123AU	Probability and Statistics	3	0	0	3
2	PC	123AN	Design and Analysis of Algorithms	3	1	0	4
3	PC	123AM	Database Management Systems	3	1	0	4
4	ES	123AP	Digital Logic Design	3	0	0	3
5	PC	123AV	Python Programming	2	0	0	2
6	PC	12313	Database Management Systems Lab	0	0	3	1.5
7	PC	12317	Python Programming Lab	0	0	2	1
8	ES	12316	IT Workshop Lab	0	0	3	1.5
9	MC	12312	Constitution of India	2	0	0	-
TOTAL				**16**	**2**	**8**	**20**

II YEAR   **II SEMESTER**

S.No.	Group	Sub Code	Subject	L	T	P	Credits
1	BS	124BG	Discrete Mathematics	3	0	0	3
2	PC	124BK	Object Oriented Programming through JAVA	3	0	0	3
3	PC	124BL	Operating Systems	3	0	0	3
4	PC	124BB	Computer Organization and Architecture	3	0	0	3
5	PC	124BP	Software Engineering	3	0	0	3
6	PC	12425	Object Oriented Programming through JAVA Lab	0	0	3	1.5
7	PC	12423	Logic Circuits and Microprocessor Lab	0	0	3	1.5
8	PW	12424	Mini Project-1 (Real Time Project)	0	0	4	2
9	MC	12422	Human Values and Professional Ethics	2	0	0	-
TOTAL				**17**	**0**	**10**	**20**

B.Tech. 4 Year (8 semesters) Regular Programme in
COMPUTER SCIENCE AND TECHNOLOGY
Course Structure
(Applicable for the Batch admitted from the Academic Year 2022-23)

III YEAR   I SEMESTER

S.No.	Group	Sub Code	Subject	L	T	P	Credits
1	PC	125CN	Full Stack Development	3	1	0	4
2	PC	125CD	Computer Networks	3	0	0	3
3	PC	125BW	Automata and Compiler Design	3	0	0	3
4	PE1	**Professional Elective-1 (Offline/Online)**		3	0	0	3
		125BA	Artificial Intelligence				
		125CJ	Distributed Systems				
		125DG	Real-time Systems				
		125BR	Advanced Computer Architecture				
5	PE2	**Professional Elective-2 (Offline/Online)**		3	0	0	3
		125CE	Data Mining				
		125CC	Computer Graphics				
		125CY	Microprocessors and Microcontrollers				
		125BT	Advanced Operating Systems				
6	PC	12533	Full Stack Development Lab	0	0	3	1.5
7	PC	12531	Computer Networks Lab	0	0	3	1.5
8	HS	12528	Advanced Communication Skills Lab	0	0	2	1
			TOTAL	15	1	8	20

III YEAR   II SEMESTER

S.No.	Group	Sub Code	Subject	L	T	P	Credits
1	HS	126EG	Managerial Economics and Financial Analysis	3	0	0	3
2	PC	126EC	Information Security	3	1	0	4
3	PC	126ED	Internet of Things	3	0	0	3
4	PE3	**Professional Elective-3 (Offline/Online)**		3	0	0	3
		126CA	Cloud Computing				
		126EP	Software Project Management				
		126CX	Machine Learning				
		126EA	Image Processing				
5	OE1	**Open Elective-1 (Offline/Online)**		3	0	0	3
6	PC	12641	Information Security Lab	0	0	2	1
7	PC	12642	Internet of Things Lab	0	0	2	1
8	PW	12644	**Mini Project-2** Industry Oriented Mini Project/Internship (during Summer between II and III years)	0	0	4	2
			TOTAL	15	1	8	20

B.Tech. 4 Year (8 semesters) Regular Programme in
COMPUTER SCIENCE AND TECHNOLOGY
Course Structure
(Applicable for the Batch admitted from the Academic Year 2022-23)

IV YEAR | | | | | | | | **I SEMESTER**

S.No.	Group	Sub Code	Subject	L	T	P	Credits
1	HS	127FN	Fundamentals of Management	3	0	0	3
2	PC	127EQ	Software Testing Methodologies	3	0	0	3
3	PE4	**Professional Elective – 4**		3	0	0	3
		127EW	Blockchain Technologies				
		127FB	DevOps				
		127CZ	Mobile Application Development				
4	PE5	**Professional Elective – 5 (Offline/Online)**		3	0	0	3
		127CS	Information Retrieval Systems				
		127GE	Wearable Technologies				
		127FA	Design Patterns				
		127CL	Embedded Systems				
5	OE2	**Open Elective – 2 (Offline/Online)**		3	0	0	3
6	PC	12765	Software Testing Methodologies Lab	0	0	2	1
7	PC	**Lab (Linked to PE4)**		0	0	2	1
		12750	Blockchain Technologies Lab				
		12754	DevOps Lab				
		12760	Mobile Application Development Lab				
8	PW1	12763	Project Work (Phase – I)	0	0	6	3
			TOTAL	**15**	**0**	**10**	**20**

IV YEAR | | | | | | | | **II SEMESTER**

S.No.	Group	Sub Code	Subject	L	T	P	Credits
1	HS	128GW	Entrepreneurship and Project Management **(Offline/Online)**	2	0	0	2
2	PE6	**Professional Elective – 6 (Offline/Online)**		3	0	0	3
		128GU	E-Commerce				
		128FZ	Soft Computing				
		128HC	High Performance Computing				
		128FS	Natural Language Processing				
3	OE3	**Open Elective – 3 (Offline/Online)**		3	0	0	3
4	PW	12870	Seminar (Presentation with Report before 1st Mid Exams)	1	0	2	2
5	PW2	12869	Project Work (Phase – II)	0	0	20	10
			TOTAL	**9**	**0**	**22**	**20**

List of Open Elective offered by various Departments for B.Tech. Programme
(Applicable for the Batches admitted from the Academic year 2022-23 onwards)

S. No.	Name of the Department Offering Open Electives	Open Elective-1 (B. Tech. III Year II Semester)	Open Elective-2 (B. Tech. IV Year I Semester)	Open Elective-3 (B.Tech. IV Year II Semester)
1	CSE/ IT/ CST	• Fundamentals of Data Structures (126KF) • Fundamentals of Database Management Systems(126KG) • Operating Systems(126KK) • Software Engineering(126KQ)	• Internet of Things(127KY) • Cyber Security(127KT)	• Cloud Computing(128LE) • Blockchain Technologies (128LD)
2	CSM	• R Programming (126KP)	• Machine Learning Basics(127KZ)	• Introduction to Natural Language Processing (128LL)
3	CSD	• Fundamentals of Data Science(126KE) • Fundamentals of Artificial Intelligence(126KD)	• Data Visualization using Python(127KU)	• Data Mining(128LF)
4	ECE	• Biomedical Electronics and Applications(126KA) • Principles of Mobile Communications(126KN) • Verilog HDL Programming(126KR)	• Electronic Measuring Instruments (127KV) • Geo-Informatics(127KW)	• Wearable Devices (128LP) • Elements of Satellite Communications (128LG)
5	ETE	• Principles of Communications (126KM)	• Telecommunication Switching Systems (127LC)	
6	EEE	• Electrical Materials(126KC)	• Renewable Energy Sources(127LA)	• Waste Management Techniques and Power Generation (128LN)
7	Mech. Engg.	• Operations Research(126KL)	• Research Methodology (127LB)	
8	H&M	• Introduction to Data Analytics(126KJ) • Intellectual Property Rights(126KH)	• Industrial Management (127KX) • Behavioral Skills and Professional Communication (127KS)	• Marketing Management (128LM)
9	BS	• Disaster Management(126KB)		• Environmental Impact Assessment (128LH)

Note: Open Elective- Students should take Open Electives from List of Open Electives Offered by Other Departments/Branches Only.

Ex: A Student of Computer Science and Engineering can take Open Electives from all other departments/ branches except Open Electives offered Computer Science and Engineering Dept.

I Year B.Tech. CST I-Semester   **L T P C**
Course Code: 121AA   **3 0 0 3**

APPLIED CHEMISTRY
(Common to EEE, ECE, ETE, CST)

Prerequisites: -Nil-

Course Objectives:
1. To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
2. To acquire the knowledge of water treatment, electrochemistry and corrosion which are essential for the Engineers and in industry.
3. To acquire the skills pertaining to Polymers and Energy sources to apply them for various engineering fields etc.
4. To impart then knowledge of engineering materials and their aspects useful for understanding material chemistry.

UNIT 1: Water and its treatment: (~8 Lecture Hours)
Introduction to hardness of water: Causes of hardness and its units. Estimation of hardness of water by complexometric method and related numerical problems. Potable water and its specifications: Steps involved in the treatment of potable water, Disinfection of potable water by chlorination and break-point chlorination. Boiler troubles: Sludges, Scales and Caustic embrittlement. Internal treatment of boiler feed water: Calgon conditioning, Phosphate conditioning, Colloidal conditioning. External treatment methods: Softening of water by Ion exchange process. Desalination of Brackish water–Reverse osmosis.

UNIT 2: Electrochemistry and corrosion: (~8 Lecture Hours)
Electrochemistry: Electrochemical cells, Electrode potential, Standard electrode potential. Nernst equation: derivation and significance. Electrochemical series and its applications. Construction and functioning of Hydrogen and Calomel electrode. pH determination using Calomel electrode. Batteries: Primary and Secondary batteries. Construction, working of Lithium Cell and Lithium-ion battery and its applications to electrical vehicles. Fuel cells: Construction and applications of Methanol Oxygen fuel cell.
Corrosion: Causes and effects of corrosion. Theories of chemical and electrochemical corrosion. Mechanism of electrochemical corrosion. Types of corrosion: Galvanic corrosion, Concentration cell corrosion, Waterline and Pitting corrosion. Factors affecting rate of corrosion. Corrosion control methods-Cathodic protection: Sacrificial anodic protection and Impressed current cathodic methods. Surface coatings: Metallic coatings – Methods of coatings: Hot dipping, galvanization, tinning.

UNIT 3: Polymeric materials: (~8 Lecture Hours)
Definition of polymers, Classification of polymers with examples. Types of polymerization: Addition Polymerization (free radical mechanism) and condensation polymerization with examples – Nylon 6:6, Terylene. **Plastics:** Definition and characteristics. Plastics: thermosetting and thermoplastics. Preparation, properties and engineering applications of PVC , Bakelite, Teflon . **Rubbers:** Natural rubber and its vulcanization. **Elastomers:** Characteristics, preparation, properties and applications of Buna-S, Butyl and Thiokol rubber. **Conducting polymers:** Characteristics and Classification with examples, mechanism of conduction in trans- polyacetylene and applications of conducting polymers. **Biodegradable polymers:** Concept and advantages of biodegradable polymers. Preparation of Polylactic acid and poly vinyl alcohol and their applications.

UNIT 4: Energy sources: (~8 Lecture Hours)

Fuels-Introduction, Calorific value of fuel: HCV, LCV, Dulong's formula. Classification of fuels: Solid fuels: coal, analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels: Petroleum and its refining. Cracking types: Moving bed catalytic cracking. Knocking: Octane and Cetane rating. Synthetic petrol - Fischer-Tropsch's process. Gaseous fuels: Composition and uses of natural gas, LPG and CNG. Combustion: Definition, Calculation of air required for the combustion of fuel, numerical problems related to calorific value and combustion. Solar cells: Introduction and applications of Solar cells. Biodiesel: Transesterification and applications.2G-Ethanol: Synthesis and applications.

UNIT 5: Engineering Materials: (~8 Lecture Hours)

Cement: Portland cement, its composition, setting and hardening of Portland cement. Special cement: Properties and uses of High alumina cement, White cement, and Waterproof cement. **Refractories:** Classification and Characteristics of a good refractory. Properties- Refractoriness and RUL**. Lubricants:** Functions and Classification of lubricants with examples. Characteristics of good lubricants. Mechanism of Lubrication: Thick film, thin film, and extreme pressure. Properties: Viscosity, Cloud and pour point, Flash and fire point.

Text Books:
1. P.C.Jain and M.Jain, Engineering Chemistry, Dhanpatrai Publishing Company, 2010.
2. RamaDevi, and Rath, Engineering Chemistry, Cengage learning, 2022.
3. M. Thirumala Chary, E. Laxminarayana and K.Shashikala, A Text book of Engineering Chemistry, Pearson Publications, 2021.
4. Y. Bharathi kumari, A Textbook of Engineering Chemistry, VGS publications.

Reference Books:
1. Shikha Agarwal, Engineering Chemistry, Cambridge University Press, Delhi, 2015.
2. Shashi Chawla, Engineering Chemistry, Dhanpatrai and Company(P)Ltd.Delhi, 2011.

Online Resources:
1. https://archive.nptel.ac.in/courses/108/106/108106170/
2. https://nptel.ac.in/courses/113105028
3. https://nptel.ac.in/courses/115107116

Course Outcomes:

The basic concepts included in this course will help the students to acquire the knowledge of:
1. The concepts to identify and analyse the hardness of water and its softening techniques in industry and daily usage.
2. The working principles of batteries and their applications in automobile field, corrosion and its prevention.
3. The concepts of various types of polymers, conducting polymers, biodegradable polymers and their applications in industrial and medical fields.
4. Different types of energy sources and their applications in various engineering fields.
5. The usage and applications of various types of cements, lubricants and refractories in engineering field.
6. The potential applications of chemistry in practical utility to become good engineers and entrepreneurs.

I Year B.Tech. CST I-Semester   **L T P C**
Course Code: 121AB   **3 0 0 3**

APPLIED PHYSICS
(Common to EEE, ECE, ETE & CST)

Prerequisites: -Nil-

Course Objectives:

Through this course the student is to:

1. Understand the fundamentals of quantum mechanics and study the behaviour of a particle quantum mechanically.
2. Analyze the semiconductors and semiconductor devices.
3. Be able to classify the types and properties of dielectric and magnetic materials
4. Understand the construction and working principle of different types of lasers and light propagation through optical fiber.
5. Learn the fundamentals of nano material synthesis and characterizations.

UNIT 1: Quantum Mechanics (~9 Lecture Hours)

Introduction to quantum physics, de-Broglie's hypothesis, Wave-particle duality, Davisson and Germer experiment, Heisenberg's Uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent wave equation, Particle in one dimensional box.

Kronig-Penny model (using Bloch theorem, qualitative analysis and conclusions), Energy bands in solids. E-k diagram, classification of materials: Metals, Semiconductors and Insulators. Density of states (Qualitative) and electron occupation probability (Fermi-Dirac Distribution function analysis)

UNIT 2: Semiconductor Physics (~9 Lecture Hours)

Intrinsic and Extrinsic semiconductors, Carrier concentrations of Intrinsic and Extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature, Carrier generation and recombination (Qualitative), Hall effect and calculation of Hall Coefficient (R_H).

Semiconductor Devices

Radiative and non-radiative recombination in semiconductors(Qualitative), Direct and Indirect band gap semiconductors, Diffusion and Drift currents , p-n junction diode, Zener diode and their V-I Characteristics, LED and Solar cell :construction, principle of operation and characteristics.

UNIT 3: Dielectric and Magnetic materials (~9 Lecture Hours)

Dielectric materials: Electric dipole, Dipole moment, Oscillating dipole, Dielectric constant, Polarizability, Electric susceptibility, Displacement vector, Polarization Vector, Qualitative study of electronic, ionic and orientation polarizations, Local field (Qualitative treatment) and Clausius-Mossotti equation; Ferro-electricity –Behaviour of $BaTiO_3$, Piezoelectricity, Pyro-electricity.

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, Domain theory(Qualitative), Hysteresis curve based on domain theory, soft and hard magnetic materials, properties of antiferro and ferri magnetic materials.

UNIT 4: Lasers and Fibre Optics (~9 Lecture Hours)

*Lasers***:** Characteristics of Lasers, Absorption, Spontaneous and stimulated emission process, Pumping, Population

inversion, Lasing action, Einstein's Coefficients and their relations. Types of Lasers: Ruby laser, Carbon dioxide (CO_2) laser, Semiconductor diode laser, Applications of laser.

Fibre Optics: Introduction, Optical fiber as a dielectric wave guide, Total internal reflection, Acceptance angle, Acceptance cone and Numerical aperture, Types of Optical fibers, Losses associated with optical fibers, Applications of optical fibers (communication system, sensors).

UNIT 5: Nanomaterials: (~8 Lecture Hours)

Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Quantum Confinement, Bottom-up Fabrication: Sol-Gel, Precipitation, Combustion Methods; Top-Down Fabrication: Ball milling method, Chemical Vapor Deposition, Physical Vapor Deposition, Characterization Techniques (XRD, SEM & TEM) and Applications.

Text Books:

1. M.N.Avadhanulu, P.G.Kshirsagar& T. V. S.Arun Murthy, "A Text book of Engineering Physics"-S.Chand Publications, 11th Edition, 2019.
2. J.P Srivastava, "Elements of Solid state physics", second edition, Prentice Hall India Publishers.
3. Donald A, Neamen, "Semiconductor Physics and Devices-Basic Principle", McGraw Hill, 4th Edition, 2021.
4. Palani Swamy, "Applied Physics", Scitech Publications.
5. Narasimha Reddy Katta, "Essentials of Nano science& Nanotechnology", Typical Creatives NANO DIGEST, 1st Edition, 2021.

Reference Books:

1. H.C.Verma, "Quantum Physics", TBS Publication,2nd Edition2012.
2. Halliday, Resnick and Walker, "Fundamentals of Physics", John Wiley & Sons, 11th Edition, 2018.
3. Charles Kittel, "Introduction to Solid State Physics", Wiley Eastern, 2019.
4. S.L.Gupta and V.Kumar, "Elementary Solid State Physics", Pragathi Prakashan,2019.
5. A.K. Bhandhopadhya, "Nano Materials", New Age International, 1st Edition, 2007.
6. Aliaksandr S. Bandarenka, "Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage" CRC Press Taylor & Francis Group.
7. M.C.Narayan, "International encyclopedia of Nanotechnology, Science and Physics"

Online Resources:

1. https://www.youtube.com/channel/UCNNlt5I3Z-Qbswfo_7KAzNA/videos

Course Outcomes:

After completion of the course, student will be able to

1. Explain the quantum mechanical aspects in physics and apply the same in differentiating the conducting properties of solids.
2. Asses and modify the carrier concentration of different types of semiconductors and also be able to understand the working of semiconducting devices.
3. Choose materials on the basis of their electric and magnetic behaviour for different engineering applications.
4. Differentiate different types of Lasers, optical fibers and realize their application in engineering fields.
5. Appreciate the importance of nano materials and their applicability in modern engineering applications.

I Year B.Tech. CST I-Semester   **L T P C**
Course Code: 121AG   **3 1 0 4**

LINEAR ALGEBRA AND MULTIVARIABLE CALCULUS
(Common to EEE, ECE, CSE, IT, ETE, 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 the system of equations.
2. To solve a 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 and 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 (only statement), Inverse and powers of a matrix using Cayley - Hamilton theorem, Diagonalization.

UNIT 3: (~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 4: (~12 Lecture Hours)
Ordinary Differential Equations
First Order ODE – Exact Differential Equations, Differential Equations reducible to exact, Orthogonal trajectories, Law of natural growth & decay.
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, $e^{ax}V(x), xV(x)$n, Method of variation of parameters, Applications to Electrical circuits.

UNIT 5: (~10 Lecture Hours)
Multiple Integrals and its Applications
Multiple Integrals - Double and Triple integrals, Change of variables, Change of order of integration.
Applications: Finding area as double integrals and volume as triple integrals.

Text Books:
1. Dr. B. S. Grewal, Higher Engineering Mathematics, 43rd 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, Subodh C.Bhunia, Engineering Mathematics, 1st Edition, Oxford Higher Education.
4. R K Jain & S R K Iyengar, Advanced Engineering Mathematics, 5th Edition, Narosa Publishers.

Online Resources:
1. https://nptel.ac.in/courses/111106051
2. https://www.youtube.com/watch?v=mIeeVrv447s

Course Outcomes:
 After completion of the course, students will be able to
1. Solve and analyse 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.

I Year B.Tech. CST I-Semester   **L T P C**
Course Code: 121AH   **3 0 0 3**

PROGRAMMING FOR PROBLEM SOLVING
(Common to EEE, ECE, CSE, IT, ETE, CST, CSM & CSD)

Prerequisites: -Nil-

Course Objectives:
1. To learn the fundamentals of computers.
2. To understand the various steps in program development.
3. To use the syntax and semantics of C Programming Language.
4. To decompose a problem into functions and to develop modular reusable code.
5. To implement C programs in structured programming approach 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: (~9 Lecture Hours)
Repetition Statements (Loops): while, for, do-while statements, Loop examples, other statements related to looping – break, continue.
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.

UNIT 3: (~10 Lecture Hours)
Arrays: Concepts, using arrays in C - declaration and definition, accessing elements in array, storing values in arrays, array applications- linear search, binary search and bubble sort, two dimensional arrays, multi-dimensional arrays.
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, pointers to void, strings - concepts, C strings, string input / output functions, arrays of strings, string manipulation functions.

UNIT 4: (~9 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: (~8 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 during file operations, 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. B.W.Kernighan and Dennis Ritchie, C Programming Language, 2nd Edition, PHI.

Online Resources:

1. https://drive.google.com/file/d/1Yvq27-sSPOxjJakf1cXpWq76L0F0cu_/view
2. https://cs50.harvard.edu/college/2022/spring/

Course Outcomes:

After completion of the course, students will be able to

1. Relate various computing environments and formulate solutions to problems using algorithms and flowcharts.
2. Understand data types and control structures to solve problems.
3. Divide a problem into functions and synthesize a complete program.
4. Use arrays, pointers and strings to formulate programs.
5. Apply user defined data types to model real world data.
6. Develop solutions to problems using file handling functions.

I Year B.Tech. CST I-Semester   **L   T   P   C**
Course Code: 121AF   **2   0   0   2**

ENGLISH FOR SKILL ENHANCEMENT
(Common to EEE, ECE, ETE & CST)

Prerequisites: -Nil-

Course Objectives: This course will enable the students to
1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Develop study skills and communication skills in various professional situations.
3. Equip students to study engineering subjects more effectively and critically using the theoretical and practical components of the syllabus.

UNIT 1: (~7 Lecture Hours)
Chapter entitled **'Toasted English'** by R.K.Narayan from *"English: Language, Context and Culture"* published by Orient Blackswan, Hyderabad.
Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes - Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives - Synonyms and Antonyms
Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.
Reading: Reading and Its Importance- Techniques for Effective Reading.
Writing: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation-Techniques for Writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT 2: (~7 Lecture Hours)
Chapter entitled **'Appro JRD'** by Sudha Murthy from "*English: Language, Context and Culture"* published by Orient Blackswan, Hyderabad.
Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs
Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.
Reading: Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice
Writing: Nature and Style of Writing- Defining /Describing People, Objects, Places and Events – Classifying-Providing Examples or Evidence.

UNIT 3: (~6 Lecture Hours)
Chapter entitled **'Lessons from Online Learning'** by F.Haider Alvi, Deborah Hurst et al from *"English: Language, Context and Culture"* published by Orient Blackswan, Hyderabad.
Vocabulary: Words Often Confused - Words from Foreign Languages and their Use in English.
Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses
Reading: Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.
Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.

UNIT 4: (~6 Lecture Hours)
Chapter entitled **'Art and Literature' by Abdul Kalam** from *"English: Language, Context and Culture"* published by Orient Blackswan, Hyderabad.
Vocabulary: Standard Abbreviations in English.
Grammar: Redundancies and Clichés in Oral and Written Communication.
Reading: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice
Writing: Writing Practices- Essay Writing-Writing Introduction and Conclusion -Précis Writing.

UNIT 5: (~6 Lecture Hours)
Chapter entitled **'Go, Kiss the World'** by Subroto Bagchifrom *"English: Language, Context and Culture"* published by Orient Blackswan, Hyderabad.
Vocabulary: Technical Vocabulary and their Usage
Grammar: Common Errors in English (*Covering all the other aspects of grammar which were not covered in the previous units*)
Reading: Reading Comprehension-Exercises for Practice
Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

Note: *Listening and Speaking Skills which are given under Unit-6 in AICTE Model Curriculum are covered in the syllabus of ELCS Lab Course.*

Note: 1. As the syllabus of English given in AICTE *Model Curriculum-2018 for B.Tech First Year is* **Open-ended***,* besides following the prescribed textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.

Note: **2**. Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents. They are advised to teach 40 percent of each topic from the syllabus in blended mode.

Text Book:
1. "English: Language, Context and Culture" published by Orient BlackSwan Pvt. Ltd, Hyderabad. 2023 Print.
2. Fusion: Integrated Reading & Writing by Kepler published by CENGAGE [e-Book]

Reference Books:
1. Effective Academic Writing by Liss and Davis (OUP)
2. Richards, Jack C, Interchange Series. Introduction, 1,2,3. Cambridge University Press, 2022.
3. Wood,F.T., Remedial English Grammar. Macmillan, 2007.
4. Chaudhuri, Santanu Sinha. Learn English: A Fun Book of Functional Language, Grammar and Vocabulary. 2nd Edition, Sage Publications India Pvt. Ltd., 2018.
5. Technical Communication. Wiley India Pvt. Ltd., 2019.
6. Vishwamohan, Aysha. English for Technical Communication for Engineering Students. Mc Graw-Hill Education India Pvt. Ltd, 2013.
7. Swan, Michael. Practical English Usage. Oxford University Press. Fourth Edition, 2016.

Online Resources:

1. https://nptel.ac.in/courses/109106116 [English Language for Competitive Exams by Prof.Aysha Iqbal, IIT Madras.]
2. https://onlinecourses.nptel.ac.in/noc22_hs77/preview [Developing Soft skills and Personality by Prof.T.Ravichandran, IIT Kanpur.]

Course Outcomes:

After completion of the course, student will be able to

1. Understand the importance of vocabulary and sentence structures
2. Choose appropriate vocabulary and sentence structures for their oral and written communication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills from the known and unknown passages.
5. Take an active part in drafting paragraphs, letters, essays, abstracts, precis and reports in various contexts.
6. Acquire basic proficiency in reading and writing modules of English.

I Year B.Tech. CST I-Semester   **L T P C**
Course Code: 12101   **0 0 2 1**

APPLIED CHEMISTRY LAB
(Common to EEE, ECE, ETE & CST)

Prerequisites: -Nil-

Course Objectives: The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:
1. Estimation of hardness of water to check its suitability for drinking purpose.
2. Perform estimations of acids and bases using conductometry, potentiometry and pH metry methods.
3. Prepare polymers such as Bakelite and nylon-6 in the laboratory.
4. Skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

List of Experiments:
I. Volumetric Analysis:
1. Estimation of hardness of water complexometric titration by using EDTA
2. Estimation of ferrous iron by Dichrometry.
3. Estimation of ferrous iron by Permanganometry.

II. Conductometry:
Estimation of the amount of given acid by Conductometry.

III. Potentiometry:
1. Estimation of the amount of given acid by Potentiometry.
2. Estimation of the amount of Fe^{2+} by Potentiometry using Potassium dichromate.

IV. pH Metry:
Determination of an acid concentration using pH meter.

V. Colorimetry:
Estimation of Copper using Colorimetry.

VI. Preparations:
1. Preparation of Bakelite.
2. Preparation Nylon – 6

VII. Lubricants:
1. Estimation of saponification value of a given lubricant oil.
2. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.

VIII. Virtual lab experiments
1. Batteries for electrical vehicles.
2. Functioning of solar cell and its applications.

Reference Books:
1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi, 2022.
2. Vogel's text book of practical organic chemistry 5th Edition.
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi, 2007.

Online Resources:
1. https://www.youtube.com/watch?v=EGV9MBzqdoA
2. http://www.titrations.info/EDTA-titration-water-hardness
3. https://www.youtube.com/watch?v=_0MteudoAqA
4. https://archive.nptel.ac.in/content/storage2/courses/104103071/pdf/mod16.pdf

Course Outcomes:
After completion of the course, students will be able to
1. Understand the concepts of error, its analysis and also to develop the skills to tabulate the experimental data and derive valid conclusions.
2. Have hands on experience in performing the electro-analytical techniques such as Conductometry, Potentiometry and pHmetry.
3. Gain the ability to prepare polymeric materials like Bakelite and Nylon-6.
4. Estimate the Saponification value and viscosity of Lubricant oil.
5. Compare the experimental results with those introduced in lecture, draw relevant conclusions and substantiate.

I Year B.Tech. CST I-Semester   **L T P   C**
Course Code: 12102   **0 0 3 1.5**

APPLIED PHYSICS LAB
(Common to EEE, ECE, ETE & CST)

Prerequisites: Nil-

Course Objectives: Through this course the student is to
1. Determine and classify magnetic materials and electro-magnetization.
2. Determine the type of semiconductor and Study the temperature dependence of resistivity.
3. Bring out the basic characteristics of semiconductor devices.
4. Construct basic electrical circuits and understand the effect of different components of the circuit on the electric parameters.
5. Learn the fundamentals of fiber optics and apply diffraction phenomenon.

Any of the following Ten experiments to be performed:

List of Experiments:

1. Biot – Savart's law to verify Magnetic field along the axis of current carrying coil – Stewart and Gees method.
2. Study B-H curve of a magnetic material.
3. To determine Energy gap of a material taken in the form of p-n junction diode.
4. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
5. To study V-I characteristics of a solar cell.
6. V-I characteristics of a p-n junction diode and Zener diode.
7. Measurement of Time constant of an R-C circuit (Charging and Discharging).
8. Resonance Phenomena & Q-factor of L-C-R circuit (Series/Parallel).
9. Evaluation of numerical aperture of a given optical fiber.
10. Bending and attenuation losses of fibers.
11. Dispersive power of the material of a prism – Spectrometer.
12. Wavelength of light and determining the LPI of unknown grating of a diffraction grating using laser.
13. To find Rigidity modulus of given material using Torsional pendulum experiment.
14. Melde's experiment – Transverse and longitudinal modes.
15. Quantum dots.
16. Polarimeter-Polarization of light.

Text Books:
1. Manual as prepared for the college by the faculty.

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

Course Outcomes:
After completion of the course, students will be able to
1. Handle different instruments, interpret the data and correlate the same with their understanding of its theory.
2. Study the electro-magnetic characteristics and determine hysteresis loss.
3. Determine hall coefficient and energy gap of the semiconductor (taken as a diode).
4. Differentiate Zener and p-n junction diode and to determine fill factor of a semiconductor solar cell.
5. Determine the time constant, resonance and quality of the circuit consisting of R, C &/ L components.
6. Determine wavelength of laser light and differentiate different types of lasers, optical fibers losses.

I Year B.Tech. CST I-Semester   **L T P   C**
Course Code: 12108   **0 0 3 1.5**

PROGRAMMING LAB
(Common to EEE, ECE, CSE, IT, ETE, CST, CSM & CSD)

Prerequisites: -Nil-

Course Objectives:
1. To gain familiarity with the programming environment to edit, compile, run and debug programs.
2. To apply the syntax and semantics of C Programming Language.
3. To develop modular, reusable and readable C programs using the concepts like arrays, functions etc.
4. To implement programs using file handling functions.

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: 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 3 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 ^nC_r value.

Week 6: 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 7: 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 implement linear search on a list of integers.

c.   Write a C program to implement binary search on a list of integers.

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

Week 8: Applications of 2D arrays

a.   Write a C program that reads two matrices and performs Addition of two matrices using functions.

b.   Write a C program that reads two matrices and performs Multiplication of two matrices using functions.

Week 9: 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.

d.   Write a C program to sort array of strings.

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 element 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: File Handling

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, 2nd Edition, C Programming Language, PHI.
4.   E.Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill.

Online Resources:

1.   https://drive.google.com/file/d/1Yvq27-qsSPOxjJakf1cXpWq76L0F0cu_/view
2.   https://cs50.harvard.edu/college/2022/spring/

Course Outcomes:

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

1.   Use tools to compile, debug, run and test the program.
2.   Translate algorithms into executable programs.
3.   Implement programs using control structures and arrays.
4.   Develop modular and reusable code using functions.
5.   Demonstrate usage of pointers, strings and structures.
6.   Solve problems using file concepts.

I Year B.Tech. CST I-Semester   **L T P C**
Course Code: 12105   **0 0 2 1**

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB
(Common to EEE, ECE, ETE & CST)

Prerequisites: -Nil-

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

Course Objectives:
To facilitate computer assisted multimedia instruction enabling individualized and independent language learning.
1. To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm.
2. To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking.
3. To improve the fluency of students in spoken English and neutralize the impact of dialects.
4. To train students to use language appropriately for public speaking, group discussions and interviews.

Syllabus: English Language and Communication Skills Lab (ELCS) shall have two parts:
a. Computer Assisted Language Learning (CALL) Lab
b. Interactive Communication Skills (ICS) Lab

Listening Skills:
Objectives
1. To enable students develop their listening skills so that they may appreciate the role in the LSRW skills approach to language and improve their pronunciation.
2. To equip students with necessary training in listening, so that they can comprehend the speech of people of different backgrounds and regions.

Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.

• Listening for general content
• Listening to fill up information
• Intensive listening
• Listening for specific information

Speaking Skills:
Objectives
1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts

- Oral practice
- Describing objects/situations/people
- Role play – Individual/Group activities
- Just A Minute (JAM) Sessions

The following course content is prescribed for the **English Language and Communication Skills Lab**.

Exercise 1:
CALL Lab:
Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening. *Practice*: Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs- Consonant Clusters- Past Tense Marker and Plural Marker- *Testing Exercises*
ICS Lab:
Understand: Spoken vs. Written language- Formal and Informal English.
Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise 2:
CALL Lab:
Understand: Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern in sentences – Intonation.
Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - *Testing Exercises*
ICS Lab:
Understand: Features of Good Conversation – Strategies for Effective Communication.
Practice: Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise 3:
CALL Lab:
Understand: Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI).
Practice: Common Indian Variants in Pronunciation – Differences between British and American Pronunciation -*Testing Exercises*
ICS Lab:
Understand: Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing
Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

Exercise 4:
CALL Lab:
Understand: Listening for General Details.
Practice: Listening Comprehension Tests - *Testing Exercises*

ICS Lab:
Understand: Public Speaking – Exposure to Structured Talks - Non- verbal Communication - Presentation Skills.
Practice: Making a Short Speech – Extempore- Making a Presentation.

Exercise 5:
CALL Lab:
Understand: Listening for Specific Details.
Practice: Listening Comprehension Tests -*Testing Exercises*
ICS Lab:
Understand: Group Discussion
Practice: Group Discussion

Minimum Requirement of infrastructural facilities for ELCS Lab:

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

System Requirement (Hardware component):
Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:
i)   Computers with Suitable Configuration.
ii) High Fidelity Headphones.

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

Source of Material (Master Copy):
Exercises in Spoken English. Part 1,2,3. CIEFL and Oxford University Press.

Note: *Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus.*

Suggested Software:
1. Cambridge Advanced Learners' English Dictionary with CD.
2. Grammar Made Easy by Darling Kindersley.
3. Punctuation Made Easy by Darling Kindersley.
4. Oxford Advanced Learner's Compass, 10th Edition.
5. English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
6. English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
7. English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
8. TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
9. Digital All Orell Digital Language Lab (Licensed Version)

Referred Lab Manual: English Language Communication Skills – Manual cum Workbook published by CENGAGE, 2022

Reference Books:

1. *English Language Communication Skills – Lab Manual cum Workbook.*   Cengage Learning India Pvt. Ltd., 2022.
2. Shobha, KN&Rayen, J. Lourdes. *Communicative English – A workbook.* Cambridge University Press, 2019.
3. Kumar, Sanjay & Lata, Pushp. *Communication Skills: A Workbook.* Oxford University Press, 2019.
4. Board of Editors. *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.* Orient Black Swan Pvt. Ltd., 2016.
5. Mishra, Veerendra et al. *English Language Skills: A Practical Approach.* Cambridge University Press, 2020.

Online Resources:

1. https://nptel.ac.in/courses/109103183 [Phonetics and Phonology: A broad overview by Prof. Shakuntala Mahanta, IIT Guwahati]
2. https://nptel.ac.in/courses/109104031 [Communication Skills by Dr.T.Ravichandran, IIT Kanpur]

Course Outcomes:

After completion of the course, student will be able to

1. Differentiate between the letters of the alphabet and the phonetic symbols.
2. Demonstrate the right pronunciation of the words in English using phonetic transcription and word stress.
3. Speak with proper intonation, voice modulation and tonal groups.
4. Maximise the listening comprehension skills through various language modules.
5. Develop Speaking skills 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 discuss in teams to present the topics and demonstrate their public speaking skills and presentation skills through various aids like posters, PPTs etc.,

I Year B.Tech. CST I-Semester   **L   T   P   C**
Course Code: 12107   **0   0   2   -**

GENDER SENSITIZATION
(Mandatory Course)
(Common to EEE, ECE, ETE & CST)

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 information 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:
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:
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:
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:
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:
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 Book:
"Towards a World of Equals: A Bilingual Textbook on Gender" written by A. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, GoguShyamala, DeepaSreenivas and Susie Tharu and published by **Telugu Akademi, Hyderabad**,Telangana State in the year 2015.

Reference Books:
1. Menon, Nivedita. Seeing like a Feminist, New Delhi: Zubaan-Penguin Books 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. https://onlinecourses.nptel.ac.in/noc22_hs51/preview
   [Contexualising Gender by Prof.Rasmi Gaur, IIT Roorkee]
2. https://onlinecourses.nptel.ac.in/noc19_hs57/preview
   [Gender justice and Workplace security by Prof.Dipa Dube, IIT Kharagpur]

Course Outcomes:
After completion of the course, student will be able to
1. Relate the understanding of gender sensitization to basic dimensions of the biological, sociological, psychological and legal aspects of gender through discussion of materials derived from research, facts, everyday life, literature and film.
2. Develop a finer grasp of how gender discrimination works in our society and how to counter it.
3. Maximize their insight into the gendered division of labour and its relation to politics and economics.
4. Perceive the genders Men and women as professionals equipped to work and live together as equals.
5. Develop a sense of appreciation of women in all occupations.
6. Identify, Understand and respond to Gender issues and to address them legally protecting and safeguarding the individual's rights.

Assessment Criteria:
SATISFACTORY PARTICIPATION CERTIFICATE shall be issued only after securing greater than or equivalent to **75%** of the attendance in the course along with the active Classroom interaction and participation by the students.

I Year B.Tech. CST II-Semester   **L T P C**
Course Code: 122AK   **3 1 0 4**

NUMERICAL TECHNIQUES AND TRANSFORM CALCULUS
(Common to EEE, ECE, CSE, IT, ETE, 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: Numerical Techniques – I (~9 Lecture Hours)
Numerical Solutions of Algebraic and Transcendental Equations: Introduction, Bisection Method, Regula-Falsi 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: Numerical Techniques – II (~9 Lecture Hours)
Numerical integration: Newton-Cote's Quadrature Formula, Trapezoidal Rule, Simpson's 1/3rd and 3/8th Rule.
Numerical solution 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 method, Fourth Order Runge-Kutta Method.

UNIT 3: Laplace Transforms (~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 (only statement), First and Second shifting theorem.
Applications of Laplace Transforms to Ordinary Differential Equations.

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

UNIT 5: Vector Integration and Integral Theorems (~10 Lecture Hours)
Vector Integration - Line Integral-Work Done-Potential function, Area, Surface and Volume Integral.
Vector Integral Theorems: Green's theorem, Stoke's theorem and Gauss's divergence theorem (only statements) and their verification.

Text Books:

1. Dr.B.S Grewal, Higher Engineering Mathematics, 43rd 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://nptel.ac.in/courses/111106101
2. https://nptel.ac.in/courses/111107108

Course Outcomes:

After completion of the course, students will be able to

1. Find the root of the algebraic and transcendental equation and solution of a linear system of equations.
2. Fit a curve for the given data.
3. Find the Numerical solutions for a given first order initial value problem and evaluate definite integral numerically.
4. Learn Laplace Transform techniques and apply for solving ODE.
5. Understand the concepts of Gradient, Divergence and Curl of a Vector and scalar point functions.
6. Evaluate the line, surface and volume integrals.

I Year B.Tech. CST II-Semester   **L T P C**
Course Code: 122AJ   **3 0 0 3**

DATA STRUCTURES
(Common to EEE, ECE, CSE, IT, ETE, CST, 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 behavior 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.

UNIT 1: (~10 Lecture Hours)
Basic Concepts: Algorithm-Introduction, Performance analysis – Time Complexity and Space Complexity, Asymptotic Notation – Big O, Omega and Theta notations, Complexity Analysis Examples.
Introduction to Data Structures: Linear and Non-linear data structures.
Review of Pointers: Pointers, Self-referential 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**.**

UNIT 2: (~9 Lecture Hours)
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.

UNIT 3: (~8 Lecture Hours)
Trees: Definitions, Terminology, Applications, Properties, Binary Tree - Array and Linked representations, Binary Tree Traversals, Threaded Binary Tree-Definition.
Priority Queues: Definition and Applications, Max Priority Queue – Implementation, Max Heap - Definition, Insertion and Deletion.

UNIT 4: (~8 Lecture Hours)
Searching: Linear Search, Binary Search, Hashing: Introduction, Hash Tables, Hash Functions, Overflow Handling.
Dictionaries: Linear List Representation, Hash Table Representations, Operations - Insertion, Deletion and Searching.
Sorting: Insertion Sort, Selection Sort, Quick Sort, Merge Sort, Heap Sort, Comparison of Sorting Methods.

UNIT 5: (~ 10 Lecture Hours)
Graph: Definitions, Terminology, Applications, Properties, Graph Representations - Adjacency Matrix, Adjacency Lists, Graph Traversal Methods – DFS and BFS

Search Trees: Binary Search Trees, Definition, Operations- Searching, Insertion and Deletion.
Balanced Search Trees: AVL Trees- Definition and Insertion, B-Trees-Definition and Examples, Comparison of Search Trees.

Text Books:
1. E. Horowitz, S. Sahni and Susan Anderson Freed, Fundamentals of Data Structures in C, 2nd Edition, Universities Press.
2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson.

Reference Books:
1. Reema Thareja, Data structures using C, 2nd Edition, Oxford higher education.
2. A. S. Tanenbaum, Y. Langsam and M.J. Augenstein, Data Structures using C, PHI/Pearson Education.
3. R. F. Gilberg and B.A. Forouzan, Data Structures: A Pseudocode Approach with C, 2nd Edition, Cengage Learning.
4. D. Malhotra, N. Malhotra, Data Structures and Program Design Using C: A Self-Teaching Introduction, Mercury Learning and Information.
5. 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. Use basic data structures such as linked list, stack and queue.
3. Implement various kinds of searching and sorting techniques.
4. Design programs using advanced data structures like hash tables, binary trees, heaps and graphs.
5. Build and compare search trees and balanced search trees.
6. Choose appropriate data structures as applied to specified problem definition.

I Year B.Tech. CST II-Semester   **L T P C**
Course Code: 122AC   **3 0 0 3**

BASIC ELECTRICAL ENGINEERING
(Common to EEE, ECE, ETE & CST)

Prerequisites: Physics

Course Objectives:
1. Concepts of Basic Magnetic and Electrical AC&DC Circuits.
2. Understand the concepts of Electrical Machines
3. To understand the VI characteristics of various Electronic components like Diode, BJT and SCR.

UNIT 1: (~11 Lecture Hours)
Magnetic Circuits and DC Circuits
Magnetic Circuits: Flux, flux density, Magnetic field Intensity, reluctance, MMF, Faraday's laws of Electromagnetic induction – statically & dynamically induced EMF-Lenz's law - Fleming's rules, Simple problems
DC Circuits: Electrical Circuit elements: R, L and C, voltage and current sources, KCL & KVL, Analysis of simple DC Circuits, Nodal and Mesh analysis of simple circuits with DC excitation, Simple problems.

UNIT 2: (~10 Lecture Hours)
Single Phase AC Circuits
Network Theorems: Superposition, Thevenin's and Norton's Theorems with independent sources (DC excitation only), Simple Problems.
1-φ AC Circuits: Representation of sinusoidal waveforms, Average and RMS values, phasor representation, power factor; Impedance and Power triangles, Resonance in Series RLC Circuit.

UNIT 3: DC Machines & Batteries (~9 Lecture Hours)
DC Machines:
DC Generators: Construction, principle of operations and types, EMF equations, simple problems.
DC Motors: Principle of operation, significance of Back EMF, Torque equation, Characteristics & applications, losses & efficiency, Direct Load test.
Batteries: Types, ratings and Applications.

UNIT 4: (~7 Lecture Hours)
AC Machines
Transformers: Construction, Principle of Operation, EMF Equation, Losses and efficiency (Direct Load Test)
Induction motors: Construction, Principle of Operation, Production of rotating magnetic field, Speed-Torque characteristics, Applications, simple Problems.
Synchronous Generators – Construction, Classification, Principle of Operation.
Synchronous Motors – Principle of operation and applications.

UNIT 5: (~7 Lecture Hours)

Basic Electronics

Operation of PN Junction Diode, BJT & SCR and their Static Characteristics, Half wave and Full wave Diode bridge rectifiers.

Text Books:

1. T.K.Nagasarkar and M.S.Sukhija, Basic Electrical Engineering, Oxford University Press, 3rd Edition, 2018.
2. D.P.Kothari and I.J.Nagrath Basic Electrical Engineering, Tata McGraw Hill, 3rd Edition, 2010.
3. Dell, Ronald M Rand, David A J, 'Understanding Batteries', Royal Society of Chemistry, (2001).
4. D.P.Kothari and I.J.Nagrath Theory and problems of Basic Electrical Engineering, PHI, 2016.

Reference Books:

1. P. S. Bimbhra, Power Electronics Khanna Publications, 2018.
2. D.C.Kulshreshtha, Basic Electrical Engineering, McGraw Hill, 1st Edition, 2009.
3. Jimmie J. Cathey, Syed A. Nasar, Basic Electrical Engineering, Schaum''s Outline
4. Huges, Electrical and Electronic Technology, Person, 2010.

Course Outcomes:

After completion of the course students should be able to:

1. Explain and analyze the magnetic and electric circuits.
2. Analyze the basic circuits with application of Network Reduction Techniques and Network Theorems.
3. Demonstrate the working principles of DC Electrical machines.
4. Demonstrate the working principles of transformers and various AC Machines.
5. Demonstrate the principle and operation of various Electronic devices like Diode, BJT and SCR.

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I Year B.Tech. CST II-Semester   **L   T   P   C**
Course Code: 122AE   **1   0   3   2.5**

ENGINEERING GRAPHICS
(Common to EEE, ECE, ETE & CST)

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

UNIT 1: (~3 Lecture Hours and 9 Practical Hours)
Introduction to Engineering Graphics: Principles of Engineering Graphics and their significance.
Scales- Plain & diagonal.
Conic Sections- Construction of ellipse, parabola and hyperbola (general method only).
Cycloidal curves: Cycloid, Epicycloid and Hypocycloid (general methods only).

UNIT 2: (~3 Lecture Hours and 9 Practical Hours)
Orthographic Projections: Principles of orthographic projections-conventions- Projections of points in all positions; projection of straight lines-line inclined to one reference plane and with two reference planes (excluding traces and midpoint problems).

UNIT 3: (~3 Lecture Hours and 9 Practical Hours)
Projections of Planes: Plane inclined to one reference plane and with two reference planes.
Projections of Solids: Projections of solids (prisms, pyramids, cylinders and cones) in simple position and axis inclined to one reference plane only.

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: (~ 4 Lecture Hours and 12 Practical Hours)
Isometric Projection: Principles of Isometric Projection – Isometric Scale
Isometric Views – Isometric views of Lines, Planes and Simple Solids only.
Orthographic Views: Conversion of Isometric Views to Orthographic Views.

Introduction to computer aided drafting (**For internal evaluation weightage only**) Introduction to Computer Aided Drafting, views and commands, orthographic projection of points, lines, planes and solids. Conversion of orthographic projection into isometric view.

Note: Syllabus for external examination will be from 1-5 units in conventional mode and introduction to computer aided drafting is exempted from the external examination.

Text Books:
1. Basanth Agrawal and Agrawal C.M., Engineering Graphics, 1st Edition, Tata McGraw Hill, 2018.
2. Bhatt N.D.,Engineering Drawing, 53rd Edition, Charotar Publishing house pvt limited, 2016.

Reference Books:
1. Venugopal.K, Engineering Drawing and Graphics Plus Autocad, New Age International (P) Ltd., New Delhi, 2010.
2. Dhananjay A Jolhe, Engineering Drawing, Tata McGraw Hill, 2014.
3. T. Jeyapoovan, Vikas: Engineering Drawing and graphics Using AutoCAD, 3rd Edition, S. Chand and company Ltd.
4. K Balaveera Reddy, Computer Aided Engineering Drawing, CBS Publishers & distributors, 2015.

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

Course Outcomes:
After completion of the course, the students will be able to
1. Acquire proficiency in instrumental drawing and will be able to visualize the object, draw conic sections and cycloidal curves.
2. Draw and understand about orthographic projections of points, straight lines.
3. Improve visualization skills in different types of planes and solids.
4. Draw and understand about the development of surfaces of various solids.
5. Ability to read, understand and interpret engineering drawings.
6. Apply computer aided drafting tools to create objects.

I Year B.Tech. CST II-Semester   **L T P   C**
Course Code: 12204   **1 0 3 2.5**

ENGINEERING WORKSHOP
(Common to EEE, ECE, ETE & CST)

Prerequisites: -Nil-

Course Objectives: The course will enable the students
1. To gain a good basic working knowledge required for the production of various engineering products.
2. To provide hands on experience about use of different Engineering materials, tools, equipment's and processes that are common in the Engineering field.
3. To develop a right attitude, team working, precision and safety at work place.
4. To study commonly used carpentry joints.
5. To have practical exposure to various welding and joining processes.

I) Trades for Exercises: (~12 Lectures + 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:
i)   Plumbing
ii)   Welding

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

Reference Books:
1. P. Kannaiah and K. L. Narayana, "Workshop Manual", 2nd Edition, Scitech publications (I) Pvt. Ltd., Hyderabad, 2015.
2. K. Venugopal, Dr. V. Prabhu Raja and 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", Media Promoters and Publishers private limited, Mumbai, vol I 2008 and Vol II 2010.

Online Resources:

1.   www.technologystudent.com

Course Outcomes:

After completion 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.   Understand the practical difficulties encountered in industries during any assembly work.
4.   Do simple electrical work through their carrier.
5.   Design different prototype in the fittings, carpentry, foundry, black smithy and sheet metal work.

I Year B.Tech. CST II-Semester   **L T P   C**
Course Code: 12209   **0 0 3 1.5**

DATA STRUCTURES LAB
(Common to EEE, ECE, CSE, IT, ETE, CST, CSM & CSD)

Prerequisites: Programming for Problem Solving

Course Objectives:
1. Write data structure programs using arrays, structures and pointers.
2. Develop applications using linear data structures such as linked lists, stacks and queues.
3. Learn to write programs to implement various sorting and searching algorithms.
4. Write programs to implement various non-linear data structures like trees, graphs and search trees.

List of Experiments:

Week 1: Write a C program to create structure with the name – student, which contains the fields - name, rollno and gender. With the help of pointer read and display the student details.

Week 2: Write a C program that uses functions to perform the following operations on a singly linked list of integers:
    a. Creation   b. Insertion   c. Deletion   d. Display

Week 3: 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 4: Write a C program to implement stack using an array and a linked list.

Week 5: Write a C program that uses stack operations to convert a given infix expression into its postfix equivalent. Implement the stack using an array.

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

Week 7: 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. To arrange a list of elements in ascending order using insertion sort.

Week 8:
a. Write a C program that implements selection sort algorithm to arrange a list of elements in descending order.
b. Write a C program that implements heap sort algorithm for sorting a list of integers in ascending order.

Week 9:
a. Write a C program that implements quick sort algorithm to arrange a list of elements in ascending order.
b. Write a C program that implements merge sort algorithm for sorting a list of integers in ascending order.

Week 10: Write a C program to implement all the functions of a dictionary using hashing.

Week 11: 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 preorder, inorder and postorder.
c. Search for an integer key in the above binary search tree recursively.
d. Traverse the above binary search tree non-recursively in inorder.

Week 12: Write a C program to perform the following:
a. Traverse a given graph using DFS algorithm.
b. Traverse a given graph using BFS algorithm.

Text Books:
1. E. Horowitz, S. Sahni and Susan Anderson Freed, Fundamentals of Data Structures in C, 2nd Edition, Universities Press.
2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson.

Reference Books:
1. Reema Thareja, Data structures using C, 2nd Edition, Oxford higher education.
2. A. S. Tanenbaum, Y. Langsam and M.J. Augenstein, Data Structures using C, PHI/Pearson Education.
3. R. F. Gilberg and B.A. Forouzan, Data Structures: A Pseudocode Approach with C, 2nd Edition, Cengage Learning.
4. D. Malhotra, N. Malhotra, Data Structures and Program Design Using C: A Self-Teaching Introduction, Mercury Learning and Information.
5. 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, the students will be able to
1. Use arrays, structures and pointers for implementing various data structures.
2. Implement various kinds of searching algorithms.
3. Implement various internal and external sorting algorithms.
4. Develop the programs for various linear data structures like stack, queue and linked list.
5. Implement non-linear data structures like graphs and trees.
6. Choose the appropriate data structure for solving real world problems.

I Year B.Tech. CST II-Semester   **L T P   C**
Course Code: 12203   **0 0 3 1.5**

BASIC ELECTRICAL ENGINEERING LAB
(Common to EEE, ECE, ETE & CST)

Prerequisites: -Nil-

Course Objectives:
1. Concepts of Basic Magnetic and Electrical AC&DC Circuits.
2. Understand the concepts of Electrical Machines
3. To understand the VI characteristics of various Electronic components like Diode, BJT and SCR.

PART-A (Compulsory)

1. Verification of KCL&KVL.
2. Verification of Superposition theorem with DC excitation.
3. Verification of Thevenin's & Norton's theorems with DC excitation.
4. Direct Load Test on Single Phase Transformer
5. OCC Test on DC Shunt Generator
6. Torque-Speed characteristics of a 3 -φ Induction Motor by conducting Load Test.
7. V-I Characteristics of PN Junction Diode and Zener Diode.
8. V-I Characteristics of SCR.

PART-B (Any two experiments)

1. Study of different types of batteries.
2. Determination of Resonant frequency & Bandwidth for a series RLC resonance circuit.
3. Output waveforms of Half wave and full wave bridge Rectifiers.
4. Static output and input characteristics of BJT.

Course Outcomes:
After completion of the course students should be able to:
1. Perform and verify different theorems with D.C excitation.
2. Perform and analysethe simple D.C circuits .
3. Perform the characteristics of DC Machines.
4. Perform different tests on the transformers and various AC Machines.
5. Perform various characteristics on Electronic devices like Diode and SCR.

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I Year B.Tech. CST II-Semester   **L T P C**
Course Code: 122AD   **2 0 0 2**

DESIGN THINKING
(Common to EEE, ECE, ETE & CST)

Prerequisites: -Nil-

Course Objectives: The main objectives of this course are
1. To inculcate attitude to solve societal problems using design thinking tools.
2. To come-up with proper design which further leads to successful products or enterprises.
3. To instill a sense of significance towards applying creativity to product and service design.

UNIT 1: (~6 Lecture Hours)
Introduction to Design Thinking: Origin of Design thinking, Importance of Design thinking, Understanding Design thinking: A non- linear process - 5-stage d.school process model, Application of design thinking.

UNIT 2: (~7 Lecture Hours)
Empathy: Difference between Empathy and Sympathy, Role of Empathy in design thinking, Empathy mapping, Understanding empathy tools: Customer Journey map, Persona; Importance of Empathizing before Ideating.
Define: Explore define phase in Design Thinking, Methods of Define phase.

UNIT 3: (~6 Lecture Hours)
Ideation: Introduction, Types of Thinking- convergent, divergent, critical and creative thinking; Ideation Methods-Brainstorming, Storyboarding, Bingo Selection, Six Thinking Hats, Mind mapping.

UNIT 4: (~6 Lecture Hours)
Prototyping and Testing: Prototyping and methods of prototyping. User testing methods, Advantages and disadvantages of user Testing/ Validation. Iteration and Pitching.

UNIT 5: (~7 Lecture Hours)
Innovation: Definition, Innovation and creativity, Innovation Triangle- Desirability, Feasibility and Viability; Types of Innovation – Product Innovation, Process Innovation and Business model Innovation.
Design thinking in various sectors: Design thinking to meet corporate needs. Case studies in Information Technology, Finance, Education, Management, Health care and Retail sector.

Textbooks:
1. Daniel Ling, Complete Design Thinking Guide for Successful Professionals, CreateSpace Independent Publishing, 2015.
2. Andrew Pressman, Design Thinking: A Guide to Creative Problem Solving for Everyone, Routledge Taylor and Francis group, 2019.

References:

1. Idris Mootee, Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design school, John Wiley & Sons, 2013.
2. Tim Brown, Change by Design_ How Design Thinking Transforms Organizations and Inspires Innovation, Harper Bollins, 2009.
3. George E Dieter, Engineering Design, 5th Edition, The McGraw-Hill Companies, 2013.

Online Resources:

1. https://www.interaction-design.org/
2. https://designthinking.ideo.com/
3. https://www.innovationtraining.org/design-thinking-mindsets/
4. https://onlinecourses.nptel.ac.in/noc20_mg38/preview
5. https://www.ideou.com/blogs/inspiration/what-is-design-thinking

Course Outcomes:

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

1. Understand the importance of various phases of Design Thinking.
2. Empathize with the customers and formulate specific problem statement.
3. Generate an idea through ideation techniques.
4. Understand various prototyping methods and Iterate solutions.
5. Understand innovation, and application of design thinking in various sectors.

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I Year B.Tech. CST II-Semester   **L T P C**
Course Code: 12206   **2 0 0 -**

ENVIRONMENTAL SCIENCE AND TECHNOLOGY
(Common to EEE, ECE, ETE & CST)

Pre requisites: Knowledge on Environmental Issues, natural resources, biodiversity, sustainable development.

Course Objectives:
1. To imbibe the importance of ecological balance for sustainable development.
2. To acquire the knowledge on the impacts of developmental activities and mitigation measures.
3. To study the international and national environmental policies and regulations.

UNIT 1: (~ 6 Lecture Hours)
Eco Systems: Definition, Scope, and Importance of ecosystem (ecosystem value, services and carrying capacity), classification, structure, and functions of an ecosystem (food chains, food webs, and ecological pyramids. flow of energy, Bio - Geo Chemical Cycles), Bio accumulation, Bio-magnification, Field visits.

UNIT 2: (~ 6 Lecture Hours)
Natural Resources: Classification of Natural Resources and their uses: 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: Forest resources**, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT 3: (~ 6 Lecture Hours)
Bio diversity 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. National Biodiversity act, Field Trip to nearby lake.

UNIT 4: (~ 7 Lecture Hours)
Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, causes, effects and control methods of **Air Pollution, Water Pollution, Soil Pollution and Noise Pollution: Solid Waste and its Management:** and characteristics of e -Waste and its management. Swach Bharat Mission – Save Soil Campaign
Global Environmental Issues and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone Depleting Substances (ODS). International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives. Environmental Control of Epidemics and Pandemics.

UNIT 5: (~ 7 Lecture Hours)
Environmental Policy, Legislation & EIA: Salient Features of Environmental Protection Act, Air Act-1981, Water Act, Forest Act, Wild life Act, National Green Tribunal Act, 2010 Municipal Solid Waste Management

and Handling Rules, Bio- medical Waste Management and Handling Rules, Hazardous Waste Management and Handling Rules, e -Waste Management and Handling Rules. EIA: Concept of EIA and importance of EIA.

Towards Sustainable Future: Concept of Sustainable Development Goals, Crazy Consumerism, Urban Sprawl, Human health, Concept of Green Building, Ecological Foot Print, Life Cycle Assessment (LCA), Low Carbon Life Style. Environmental Ethics and Economics.

Text Books:
1. Erach Bharucha, Textbook 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, Textbook of Environmental Science and Technology, BS Publications, 2007.
6. Y. Anjaneyulu, Introduction to Environmental Science, BS. Publication.

Online Resources:
1. https://www.epa.gov/students/lesson-plans-teacher-guides-and-online-environmental-resources-educators.
2. https://onlinecourses.swayam2.ac.in/cec20_hs10/preview
3. https://open.ed.ac.uk/environment-sustainability-resources/
4. https://onlinepublichealth.gwu.edu/resources/sources-for-climate-news/

Course Outcomes:
After completion of the course, students will be able to
1. Based on this course, the Engineering graduate will understand/evaluate/develop technologies based on ecological principles and environmental regulations, which in turn helps in sustainable development.
2. Acquire the knowledge on ecological principles and functions of eco systems and their importance for survival.
3. Develop the knowledge on role of natural resources for sustenance of life.
4. Analyze the concepts of bio - diversity and its role in the maintenance of ecological balance.
5. Evaluate the various causes, effects, control/mitigation of environmental pollution on man and environment.
6. Follow the environmental legislations in their daily life and professional practice to protect the environment.

II Year B.Tech. CST I-Semester   **L T P C**
Course Code: 123AU   **3 0 0 3**

PROBABILITY AND STATISTICS
(Common to CSE, IT, CST, CSM & CSD)

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 concepts 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, Exponential Distribution Sampling Distribution of means. (ó Known and unknown)

UNIT 3: (~ 10 Lecture Hours)
Estimation and Inference Theory
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: (~ 8 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. Jay L. Devore, Probability and Statistics for Engineering and Sciences, 9th Edition, Cengage Publications.

Reference Books:
1.   S.P.Gupta, Statistical Methods, 33rd Edition, Sultan Chand & Sons.
2.   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 sample.
5.   Apply testing of hypothesis for small sample.
6.   Estimate and establish relation between variables using correlation and regression analysis.

II Year B.Tech. CST I-Semester   **L T P C**
Course Code: 123AN   **3 1 0 4**

DESIGN AND ANALYSIS OF ALGORITHMS
(Common to CSE, IT, CST, CSM & CSD)

Prerequisites: Programming for Problem Solving, Data Structures.

Course Objectives:
1. Analyze the asymptotic performance of algorithms.
2. Apply important algorithmic design paradigms and methods of analysis.
3. Synthesize efficient algorithms in common engineering design situations.
4. Classify and categorize the problems into P and NP.

UNIT 1: (~8 Lecture Hours)
Introduction: Characteristics of algorithm, Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behaviour, Performance measurements of Algorithm- Time and space trade-offs, Analysis of recursive algorithms through recurrence relations- Substitution method and Masters method, Fundamental Algorithmic strategies – General Methods.
Divide and conquer- Binary search, Merge sort, Quick sort, Strassen's Matrix Multiplication.

UNIT 2: (~10 Lecture Hours)
Disjoint Sets: Disjoint set operations, union and find algorithms, connected components and bi-connected components.
Greedy method- Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees: Prim's and Kruskal's, Huffman Coding.

UNIT 3: (~10 Lecture Hours)
Dynamic Programming: Chained matrix multiplication, All pairs shortest path problem, Optimal binary search trees, 0/1 knapsack problem, Reliability design, Traveling salesperson problem.

UNIT 4: (~10 Lecture Hours)
Backtracking: The n-queens problem, Sum of Subsets problem, Graph Coloring, Hamiltonian cycles.
Branch and Bound: 0/1 Knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution, Travelling salesperson problem.

UNIT 5: (~8 Lecture Hours)
NP-Hard and NP-Complete problems: Basic concepts, Non-deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.
Approximation Algorithms: The vertex-cover problem, Travelling salesperson problem, the subset-sum problem.

Text Books:

1. Ellis Horowitz, Sartaj Sahni and S. Rajasekharan, Fundamentals of Computer Algorithms, 2nd Edition, Universities Press.
2. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, Introduction to Algorithms, 4th Edition, MIT Press/McGraw-Hill.

Reference Books:

1. M. T. Goodrich and R.Tomassia, Algorithm Design: Foundations, Analysis and Internet examples, John Wiley and sons.
2. Aho, Ullman and Hopcroft, Design and Analysis of Algorithms, Pearson Education.

Online Resources:

1. https://web.stanford.edu/class/archive/cs/cs161/cs161.1138/
2. https://nptel.ac.in/courses/106101060
3. https://onlinecourses.swayam2.ac.in/cec20_cs03/preview
4. https://www.udemy.com/course/design-and-analysis-of-algorithms/

Course Outcomes:

After completion of the course, students will be able to

1. Apply design principles and concepts to algorithms.
2. Evaluate asymptotic run-time complexity of algorithms and recurrence relations.
3. Design algorithms for realistic problems such as divide and conquer, greedy, non-deterministic and approximation problems.
4. Develop dynamic programming algorithms and analyze their computational complexity.
5. Use Backtracking and Branch & Bound techniques to solve real world problems.
6. Formulate approximation algorithms for finding optimal solutions.

II Year B.Tech. CST I-Semester   **L T P C**
Course Code: 123AM   **3 1 0 4**

DATABASE MANAGEMENT SYSTEMS
(Common to CSE, IT, CST, CSM & CSD)

Prerequisites: Data Structures

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. To familiarize with the basic issues of transaction processing and concurrency control.
5. To familiarize with database storage structure, indexing and recovery mechanisms.

UNIT 1: (~10 Lecture Hours)
Introduction: History of Database System, 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 and Triggers.
Normalization: Introduction to Schema Refinement, Functional dependency theory, 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. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, 3rd Edition, McGraw Hill Education (India) Private Limited.

Reference Books:

1. C.J. Date, A.Kannan and S.SwamiNadhan, An Introduction to Database systems, 8th Edition, Pearson Education.
2. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, 6th Edition, Pearson Education.

Online Resources:

1. https://www.tutorialspoint.com/dbms/index.htm
2. https://beginnersbook.com/2015/04/dbms-tutorial
3. https://nptel.ac.in/courses/106/105/106105175

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 the principles of database transaction management.
6. Understand the storage and recovery of database.

II Year B.Tech. CST I-Semester
Course Code: 123AP

L T P C
3 0 0 3

DIGITAL LOGIC DESIGN
(Common to CSE, IT, 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.

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. Digital Integrated Circuits.

Text Books:
1. M. Morris Mano and M.D.Ciletti, Digital Design, 6th Edition, Pearson.
2. R.P. Jain, Modern Digital Electronics, Tata McGraw Hill Education, 2010.

Reference Books:
1. A. Kumar, Fundamentals of Digital Circuits, Prentice Hall India, 2016.
2. M.Morris Mano, Computer System Architecture, 3rd Edition, Pearson.

Online Resources:
1. www.tutorialspoint.com/digital_circuits/index.htm
2. https://nptel.ac.in/courses/108105132

Course Outcomes:
After completion of the course, students will be able to
1. Interpret different Number systems, Binary codes and Boolean algebra.
2. Solve Boolean expressions using minimization methods.
3. Using the concepts of combinational circuits, design simple applications.
4. Design Hardware that suits various Micro-Operations.
5. Distinguish different types of Sequential circuits.
6. Describe functionality of memory devices.

II Year B.Tech. CST I-Semester   **L T P C**
Course Code: 123AV   **2 0 0 2**

PYTHON PROGRAMMING
(Common to EEE, ECE, CSE, IT, ETE, CST, CSM & CSD)

Prerequisites: -Nil-

Course Objectives:
1. Learn syntax and semantics and create functions in Python.
2. Facilitate learning to use lists, tuples, strings and dictionaries in Python programs.
3. Impart knowledge on files and exception handling in Python.
4. Introduce GUI programming and data handling.

UNIT 1: (~5 Lecture Hours)
Introduction to Python Programming: Using Python, The IDLE Programming Environment, Input, Processing and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, More about Data Output: New line, Item Separator, Escape Characters, Formatting parameters.
Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables.

UNIT 2: (~5 Lecture Hours)
Repetition Structures: Introduction, while loop, for loop, Sentinels, Input Validation Loops, Nested Loops.
Functions: Introduction, Defining and Calling a Function, designing a Program to use Functions, Local Variables, Passing Arguments to Functions, Global Variables and Global Constants, Value-Returning Functions: Generating Random Numbers, Writing Our Own Value-Returning Functions, Recursion.

UNIT 3: (~6 Lecture Hours)
Lists and Tuples: Sequences, Introduction to Lists, List slicing, Finding Items in Lists with the in Operator, List Methods and Useful Built-in Functions, Copying Lists, Processing Lists, Two-Dimensional Lists, Tuples.
Strings: Basic String Operations, String Slicing, Testing, Searching, and Manipulating Strings.
Dictionaries and Sets: Dictionaries, Sets, Serializing Objects.

UNIT 4: (~6 Lecture Hours)
Files and Exception: Introduction to File Input and Output, Using Loops to Process Files, Processing Records, Exceptions.
Modules: Namespaces, Importing Modules, Importing Module attributes, Module built-in functions, Packages, other features of Module.
Regular Expressions: Introduction, Special Symbols and Characters, REs and Python.

UNIT 5: (~ 6 Lecture Hours)
GUI Programming: Graphical User Interfaces, Using the tkinter Module, Display text with Label Widgets, Organizing Widgets with Frames, Button Widgets and Info Dialog Boxes, Getting Input with Entry Widget, Using

Labels as Output Fields, Radio Buttons, Check Buttons.

Introduction to Plotting in Python – Basic Plots- Line and Scatter Plot, box plot, bar plots, Histograms and plotting data contained in files.

Text Books:
1. Tony Gaddis, "Starting Out with Python", 3rd Edition, Pearson, 2015.
2. Wesley J. Chun, Core Python Programming, 2nd Edition, Pearson.

Reference Books:
1. Reema Thareja "Python Programming", Oxford Press, 2017.
2. Allen Downe, "Think Python: How to Think like Computer Scientist", 2nd Edition, O'Reilly publications.

Online Resources:
1. https://www.python.org/
2. https://www.w3schools.com/python/
3. https://www.tutorialspoint.com/python/index.htm
4. https://www.digimat.in/nptel/courses/video/106106182/L01.html
5. https://www.geeksforgeeks.org/simple-plot-in-python-using-matplotlib/

Course Outcomes:
After completion of the course, students will be able to
1. Understand the fundamental concepts of Python Programming.
2. Apply the concepts of control structures and usage of functions in Python Programming.
3. Design Python programs using data structures like List, Tuple, Strings and Dictionaries.
4. Develop proficiency in handling files, exceptions and modules.
5. Construct regular expressions and design GUI based applications using Python.
6. Interpret various data visualization techniques.

II Year B.Tech. CST I-Semester   **L T P   C**
Course Code: 12313   **0 0 3 1.5**

DATABASE MANAGEMENT SYSTEMS LAB
(Common to CSE, IT, 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, views, procedures and cursors.

List of Experiments:

Week 1: Practicing Data Definition Language commands.

Week 2: Practicing Data Manipulation Language commands.

Week 3: Implementation of Integrity Constraints (Table Level and Column Level).

Week 4: Practicing Data Retrieval Language commands.

Week 5: Practicing queries using Aggregate Operations, **groupby** and **having**, Set Operations.

Week 6: Practicing Sub Queries and Correlated Nested Queries using **in, any, all, exists** etc.

Week 7: Practicing queries using **join** expressions, creating and querying on views.

Week 8: Basic PL/SQL Programs. (PL/SQL Environment)

Week 9: Implementation of Triggers and Functions.

Week 10: Implementation of Procedures and Cursors.

Week 11-12: **A Case Study on any one real time database application**
Objective: To enable the students to practice the concepts learnt in the course "DBMS" by developing a database using Oracle SQL. The student is expected to practice designing, developing and querying a database by using both SQL and PL/SQL concepts.
a) E-R Modeling of the case study chosen.
b) Normalization of tables.
c) Creation of relations as per the case study.

d) Inserting data into the tables.
e) Practice the Queries by using SQL Concepts.
f) Design and develop the following on the case study.
    i. Triggers   ii. Cursors

Text Books:
1. S. Shah and V.Shah, Oracle for Professionals:1 (X-Team), 1st Edition, Shroff Publishers & Distributers 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. Demonstrate Triggers, Cursors and Stored Procedures on Database.

II Year B.Tech. CST I-Semester
Course Code: 12317

L T P C
0 0 2 1

PYTHON PROGRAMMING LAB
(Common to EEE, ECE, CSE, IT, ETE, CST, CSM & CSD)

Prerequisites: Programming for Problem Solving

Course Objectives:
1. Describe the core syntax and semantics of Python programming language.
2. Learn the fundamental sequence types like lists, dictionaries, tuples, sets.
3. Handle files and modules in python.
4. Learn how to write string, Exception Handling programs in python.

List of Experiments:

Week 1:
a) Write a program to demonstrate different number data types in Python.
b) Write a program to illustrate various types of operations in Python.

Week 2:
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 3:
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 4:

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 5:

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.
d) 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 6:

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 Python program to define a module to find Fibonacci Numbers and import the module to another program.
d) Define a module that consist of factorial and sum of individual digits of a number as functions.
e) Write a program to find ncr by importing only factorial function from the above module.

Week 7:

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 8: Write a Python application to create basic calculator to demonstrate following GUI components.
    i) Button   ii) Text box   iii) Text area

Week 9: Write a Python application to create basic Registration form to demonstrate following GUI components.
    i) Text box ii) Button   iii) Submit button   iv) Combo box
    v) Check button   vi) Text widget   vii) Radio button   viii)Scrolled Text

Week 10: Write a Python program to draw following plots
    i)   Bar graph.   ii) Scatter plot.   iii) Box plot.

Text Books

1. Wesley J. Chun, Core Python Programming, 2nd Edition, Pearson.
2. Gowrishankar S, Veena A, Introduction to Python Programming, 1st Edition, CRC Press/Taylor Francis, 2018. ISBN-13: 978-0815394372.

Reference Books:

1. Y Daniel Liang, Introduction to Programming Using Python, 1st Edition, Pearson India, 2017.

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. Understand and Apply basic concepts of Python.
2. Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements.
3. Determine the methods to create Python programs by utilizing lists, dictionaries, tuples, sets and strings.
4. Develop the proficiency in handling of files and modules.
5. Implement the concept of Exception handling using Python.
6. Utilize Python libraries for data visualization.

II Year B.Tech. CST I-Semester   **L   T   P   C**
Course Code: 12316   **0   0   3   1.5**

IT WORKSHOP LAB
(Common to CSE, IT, CST, CSM & CSD)

Prerequisites: -Nil-

Course Objectives:
1. Introduction to a personal computer and its basic peripherals, the process of disassembling and assembling a personal computer.
2. Bring in the usage of productivity tools using open office tools and LaTeX.
3. To introduce HTML for developing web pages.
4. To introduce PHP language for Server Side Scripting.

List of Experiments:
   Note: Week - 2 to Week - 7 Experiments to be done using MS Office / Open Office.

Week 1:
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 Operating System.

Week 2:
a. **Creating a Resume**: Features to be covered: Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
b. **Creating a newsletter**: Features to be covered: Table of Content, Newspaper columns, Inserting images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs in word.

Week 3:
a. **Create Letters using Mail Merge:** Features to be covered: Date and Time option, Greeting Line, Inserting Table and database.
b. **Creating a Scheduler**: Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text, Freezing Rows and Columns, Selecting Ranges.

Week 4:
Calculation of Grade Point Average: Features to be covered: Cell Referencing, Formulae in spreadsheet - Average, Standard Deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, Sorting, Conditional Formatting
Data Processing: Features to be covered, Importing data from different files and database.

Week 5: Data Analyzing and Visualizing: Features to be covered: Pivot Tables, Slicers, Pivot Charts.

Week 6: Creating Databases: Features to be covered: Creating database using templates, Object types – Tables, Queries etc.

Week 7: Features to be covered: Creating Reports using Report wizard.

Week 8:

a. **Creating a Report in LaTeX**: Features to be covered: Newspaper columns, Inserting Images from files, Formatting Images, Inserting tables, Graphs and References.

b. **Creating Slides in LaTeX**: Features to be covered: Inserting Text, Formatting Text, Text color, Bullets and Numbering.

Week 9: Develop a webpages using HTML consisting of Text, Images, Tables, Lists, Hyperlinks.

Week 10: Develop Web page using HTML Frames and Style Sheets.

Week 11: Installation of XAMPP.

Week 12: Develop a Web Application in PHP to read data from web form controls like text boxes, radio buttons, lists etc.

Text Books:

1. Jennifer Sargunar, Introduction to Information Technology, ITL Education Solutions Limited, 7th Edition, Pearson Education.
2. Frank Mittelbach and Michel Goossens, LaTeX Companion, 2nd Edition, PHI/Pearson.
3. Steven Holzner, PHP: The Complete Reference, 5th Edition, Tata McGraw-Hill Education, 2007.

Reference Books:

1. Vikas Gupta, Comdex Information Technology Course Tool Kit, Edition, WILEY Dreamtech, 2005.
2. David Anfinson and Ken Quamme, IT Essentials PC Hardware and Software Companion Guide 3rd Edition, CISCO Press, Pearson Education.
3. Chris Bates, Web Programming. Building Internet Applications, 3rd Edition, Wiley, 2006.

Online Resources:

1. www.w3schools.org.in
2. https://en.wikibooks.org/wiki/LaTeX

Course Outcomes:

After completion of the course, students will be able to

1. Recognizing basic peripherals of computer and perform Computer Disassembling / Assembling.
2. Understanding the installation of OS and server side scripting with PHP language.
3. Apply the office tools for preparing documents, Data Analyzing and Visualizing.
4. Creating the database, importing & exporting databases and generating reports.
5. Preparing documents and slides using LaTeX.
6. Develop static Web Pages using HTML.

II Year B.Tech. CST I-Semester   **L T P C**
Course Code: 12312   **2 0 0 -**

CONSTITUTION OF INDIA
(Mandatory Course)
(Common to EEE, ECE, CSE, IT, ETE, CST, CSM & CSD)

Prerequisites: -Nil-

Course Objectives:
1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. Address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To realise the significance of constitution of India from all walks of life and to understand the basic concepts of Indian constitution.

UNIT 1: (~8 Lecture Hours)
HISTORY OF MAKING OF THE INDIAN CONSTITUTION & PHILOSOPHY OF THE INDIAN CONSTITUTION HISTORY OF MAKING OF THE INDIAN CONSTITUTION
History, Drafting Committee (Composition & Working) **Philosophy of the Indian Constitution**: Preamble, Salient Features.

UNIT 2: (~6 Lecture Hours)
CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES
Fundamental Rights - Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies; Directive Principles of State Policy, Fundamental Duties.

UNIT 3: (~6 Lecture Hours)
ORGANS OF GOVERNANCE
Parliament, Composition, Qualifications and Disqualifications, Powers and Functions- Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT 4: (~6 Lecture Hours)
LOCAL ADMINISTRATION
District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative CEO of Municipal Corporation, Panchayati Raj : Introduction, PRI : ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Position and role, Block Level : Organizational Hierarchy (Different departments), Village level : Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT 5: (~6 Lecture Hours)
ELECTION COMMISSION
Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

Reference Books:
1. The Constitution of India, Government Publication, 1950 (Bare Act).
2. Dr.S.N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M.P. Jain, Indian Constitution Law, 7th Edition, Lexis Nexis, 2014.

Online Resources:
1. https://nptel.ac.in/courses/129106003 [Constitutional Studies by Prof. Sudhir Krishna Swami, IIT Madras]
2. https://onlinecourses.swayam2.ac.in/cec20_hs38/preview [Indian Government and Politics by Dr.Aijaz Ashraf Wani, University of Kashmir, Srinagar]

Course Outcomes:
After completion of the course, students will be able to
1. Tell about function of Indian constitution with clarity and understanding.
2. Identify the Rights of equality, the Right of freedom and the Right to constitutional remedies.
3. Mark the knowledge of union government & their powers and function.
4. Define the state and central policies, fundamental duties.
5. Explain the powers and functions of Municipalities, Panchayats and Co-operative Societies.
6. Discuss the Electoral Process, special provisions.

Assessment Criteria:
SATISFACTORY PARTICIPATION CERTIFICATE shall be issued only after securing greater than or equivalent to **75%** of the attendance in the course along with the active Classroom interaction and participation by the students.

II Year B.Tech. CST II-Semester   **L T P C**
Course Code: 124BG   **3 0 0 3**

DISCRETE MATHEMATICS
(Common to CSE, IT, CST, CSM & CSD)

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

UNIT 2: (~10 Lecture Hours)
Set Theory: Basic concepts of Set Theory, Operations on Sets, Relations and Ordering: Properties, Relation Matrix and the Graph of a Relation, Partition and Covering, Equivalence, Compatibility, Composition of Binary relations, Transitive Closure, Partial Ordering, Hasse Diagrams, Functions: Bijective, Composition, Inverse, Recursive Functions, Lattice and its Properties.
Algebraic Structures: Algebraic Systems, General Properties, Semi Groups and Monoids, Group, Subgroup, Homomorphism, Isomorphism, Abelian Group.

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 non-homogeneous Recurrence Relations.

UNIT 5: (~8 Lecture Hours)
Graph Theory: Basic Concepts, Isomorphism and Sub graphs, Graph Representations: Adjacency and Incidence Matrices, Bipartite and Planar Graphs, Euler's formula, Multigraphs and Euler's circuit, Hamiltonian Graphs.

Trees: Basic Concepts, properties, Directed trees, Binary trees, Spanning Trees - BFS and DFS Spanning trees, Minimal spanning trees - Prim's and Kruskal's Algorithms, Graph Coloring, Chromatic Number, the Four Color problem.

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

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. Thomas Koshy, Discrete Mathematics with Applications, Elsevier Academic Press, 2012.

Online Resources:
1. https://onlinecourses.nptel.ac.in/noc22_cs33/preview
2. https://onlinecourses.nptel.ac.in/noc22_cs04/preview

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. Acquire 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.

II Year B.Tech. CST II-Semester   **L T P C**
Course Code: 124BK   **3 0 0 3**

OBJECT ORIENTED PROGRAMMING THROUGH JAVA
(Common to CSE, IT, 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 of swing controls and connecting to database using JDBC.

UNIT 1: (~9 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, Random, Scanner.

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 Subclasses.
Multithreading: Differences between Thread-Based Multitasking and Process-Based Multitasking, Java Thread Model, Creating Threads, Thread Priorities, Synchronizing Threads, Inter Thread Communication.
JDBC: Introduction to JDBC drivers, Types of Drivers, java.sql package, Connecting to a Database using JDBC, Manipulating data in Database.

UNIT 4: (~10 Lecture Hours)
Event Handling: The Delegation Event Model - Events, Event Sources, Event Listeners, Event Classes, Handling Mouse and Keyboard Events, Adapter Classes, Regular Expressions - Regular Expression Processing.
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.

UNIT 5: (~ 9 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, Lamda Expressions- Lamda Expression Fundamentals, Functional Interfaces, Lamda Expression examples.
The Collections Framework (java.util): Collections Overview, Collection Interfaces, The Collection Classes - ArrayList, LinkedList, Iterator, The For-Each alternative, HashTable, Stack, StringTokenizer, Calendar.

Text Books:
1. Herbert Schildt, Java: The Complete Reference, 10th 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.
3. Jim Keogh, J2EE: The Complete Reference, McGraw Hill Education (India) Pvt. Ltd., 2017.

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. H.M. Dietel and Dietel, Java – How to Program, 6th Edition, Pearson Education/PHI.
5. Cay Horstmann, Big Java, 4th Edition, John Wiley and Sons Publisher, 2009.

Online Resources:
1. https://docs.oracle.com/javase/tutorial/java/TOC.html
2. https://onlinecourses.nptel.ac.in/noc22_cs47/preview
3. 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. Understand the concepts of Exception Handling and Event Handling.
3. Recognize the importance of multithread with Synchronization.
4. Demonstrate the use of Inheritance and Packages.
5. Solve problems using Java Collection Framework and I/O classes.
6. Design GUI using Swing Controls and connecting to Database.

II Year B.Tech. CST II-Semester   **L T P C**
Course Code: 124BL   **3 0 0 3**

OPERATING SYSTEMS
(Common to CSE, IT, CST, CSM & CSD)

Prerequisites: Data Structures

Course Objectives:
1. Interpret the role of an Operating System in the overall computer system and study the operations performed by it as a resource manager.
2. Understand the scheduling policies and different memory management techniques for different Operating Systems.
3. Examine process concurrency, synchronization and deadlock situation.
4. Assess the concepts of I/O, storage and file management and introduce system call interface for file and process management.
5. Outline the goals and principles of protection.

UNIT 1: (~10 Lecture Hours)
Introduction: Overview-Introduction-Operating System objectives and functions, User view, System view, Operating System definition, Evolution of Operating System- Simple Batch systems, Multiprogrammed, Time-Sharing Systems, 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's 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 and 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 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. Charles Crowley, Operating System: A Design-oriented Approach, 1st Edition, Irwin Publishing.
2. Gary J. Nutt and 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 and Marco Cesati, Understanding the Linux Kernel, 3rd Edition, O'Reilly and Associates.

Online Resources:
1. https://www.docdroid.net/vp5Cfdg/abraham-silberschatz-operating-system-concepts-9th201212-pdf
2. https://www.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/

Course Outcomes:

After completion of the course, students will be able to
1. Understand fundamentals of Operating System.
2. Demonstrate the concepts of process, thread and scheduling algorithms.
3. Apply process synchronization methods to solve critical section problem.
4. Solve deadlock problems using various deadlock management techniques.
5. Compare the different memory management techniques.
6. Summarize file & disk management, protection & security concepts and evaluate the performance of disk scheduling algorithms.

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II Year B.Tech. CST II-Semester   **L T P C**
Course Code: 124BB   **3 0 0 3**

COMPUTER ORGANIZATION AND ARCHITECTURE
(Common to CSE, IT, 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 and 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, Addressing Modes, 8086 Instruction Set and Assembler Directives, 8086 Signal Description, Physical Memory Organization, 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)
Parallel Processing: Introduction, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Hazards, Vector Processing, Array Processors.
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.
3. Douglas V. Hall, Microprocessor and Interfacing, 2nd 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:
1. 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. Realize the Instruction Set, Addressing Modes and Assembler Directives of 8086 and write ALP for problem solving.
3. Understand the I/O organization and its connection to CPU.
4. Understand the Memory Hierarchy and their importance.
5. Comprehend the advantage of Instruction Level Parallelism, Pipelining and characteristics of Multi-Processor architecture for high performance Processor design.

II Year B.Tech. CST II-Semester   **L T P C**
Course Code: 124BP   **3 0 0 3**

SOFTWARE ENGINEERING
(Common to CSE, IT & CST)

Prerequisites: -Nil-

Course Objectives:
1. Understand the software life cycle models.
2. Understand the importance of the software development process.
3. Understand the importance of modeling and modeling languages.
4. Design and develop correct and robust software products.

UNIT 1: (~10 Lecture Hours)
Introduction to Software Engineering: The evolving role of software, changing nature of software, software myths.
A Generic view of process: Software engineering- a layered technology, A process framework, The capability maturity model integration (CMMI), Process patterns, Process assessment, Personal and team process models.
Process models: The Waterfall model, Incremental process models, Evolutionary process models, The unified process.

UNIT 2: (~9 Lecture Hours)
Software Requirements: Functional and non-functional requirements, User requirements, System requirements, Interface specification, The software requirements document.
Requirements engineering process: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.
System models: Context models, Behavioural models, Data models, Object models, Structured methods.

UNIT 3: (~9 Lecture Hours)
Design Engineering: Design process and design quality, Design concepts, The design model.
Creating an architectural design: Software architecture, Data design, Architectural styles and patterns, Architectural design, Conceptual model of UML, Basic structural modelling, Class diagrams, Sequence diagrams, Collaboration diagrams, Use case diagrams, Component diagrams.
Performing user interface design: Golden rules, User interface analysis, and design, Interface analysis, Interface design steps, Design evaluation.

UNIT 4: (~9 Lecture Hours)
Testing Strategies: A strategic approach to software testing, Test strategies for conventional software, Black-box and white-box testing, Validation testing, System testing, The art of debugging.
Product metrics: Software quality, Metrics for analysis model, Metrics for design model, Metrics for source code, Metrics for testing, Metrics for maintenance.

UNIT 5: (~8 Lecture Hours)

Metrics for Process and Products: Software measurement, Metrics for software quality.

Risk management: Reactive Vs proactive risk strategies, Software risks, Risk identification, Risk Projection, Risk refinement, RMMM, RMMM plan.

Quality Management: Quality concepts, Software quality assurance, Software reviews, Formal technical reviews, Statistical software quality assurance, Software reliability, The ISO 9000 quality standards.

Text Books:

1. Roger S. Pressman, Software Engineering - A Practitioner's Approach, 6th Edition, McGraw Hill Companies, Inc.
2. Sommerville, Software Engineering, 7th Edition, Pearson Education.

Reference Books:

1. Grady Booch, James Rambaugh and Ivar Jacobson, The Unified Modeling Language User Guide, 2nd Edition, Pearson Education.
2. Waman S Jawadekar, Software Engineering Principles and Practice, The McGraw-Hill Companies, 2004.

Online Resources:

1. https://alison.com/courses/software-engineering.
2. https://study.com/articles/List_of_Free_Online_Software_Engineering_Courses.html

Course Outcomes:

After completion of the course, students will be able to

1. Understand basic software engineering methods along with practices, process framework and process models.
2. Analyze software requirements, SRS documents and Project Management.
3. Develop different system models that describe the functionality of the system.
4. Design and maintain efficient, reliable and cost effective software solutions and suitable software metrics.
5. Understand various software testing approaches and techniques used for software assessment.
6. Interpret the significance of Software measurement, software risks and quality control.

II Year B.Tech. CST II-Semester   **L T P   C**
Course Code: 12425   **0 0 3 1.5**

OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB
(Common to CSE, IT, 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. Gain knowledge of swing controls and connecting to database using JDBC.

Note: Use Linux/Windows for Lab Experiments. Though not mandatory, encourage the use of the 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 checks whether the given string is a palindrome or not.
b. Write a Java program to multiply given 3X3 matrices.

Week 3:
a. Write a Java program that accepts a number from the end-user and then prints all prime numbers up to a given number.
b. Write a Java program to create a Box class with properties like length, breadth, width, and volume. Display the volume of 2 different boxes by using objects.

Week 4:
a. Write a Java program that demonstrates constructor overloading.
b. Write a Java program to implement the use of inner classes.

Week 5:
a. Write a Java program that demonstrates the following:
    i. Method overloading
    ii. Method overriding.
b. 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.

c. Write a Java program that implements multiple inheritance.

Week 6:

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 7:

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 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 to connect to database and display Employee details (eid,ename,dept and salary).

Week 11:

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 12:

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).

Text Books:
1.   Herbert Schildt, Java: The Complete Reference, 10th Edition, McGraw Hill Education (India) Pvt. Ltd.
2.   Jim Keogh, J2EE: The Complete Reference, McGraw Hill Education (India) Pvt. Ltd., 2017.

Reference Books:
1.   Timothy Budd, Understanding Object-Oriented Programming with Java, updated Edition, Pearson Education.
2.   Y. Daniel Liang, Introduction to Java Programming, Comprehensive Version, 7th Edition, Pearson Education.
3.   H.M. Dietel and Dietel, Java – How to Program, 6th Edition, Pearson Education/PHI.

Online Resources:
1.   https://docs.oracle.com/javase/tutorial/java/TOC.html
2.   https://onlinecourses.nptel.ac.in/noc22_cs47/preview
3.   www.javatpoint.com/java-tutorial

Course Outcomes:
After completion of the course, students will be able to
1.   Implement the object oriented programming concepts and solve real-world problems.
2.   Develop programs using Inheritance, Interface and Packages.
3.   Demonstrate the concepts of exception handling and Event Handling.
4.   Implement real-time applications using Multithread with Synchronization.
5.   Solve problems using java collection framework and I/O classes.
6.   Design GUI using Swing controls and connecting to Database.

II Year B.Tech. CST II-Semester   **L T P C**
Course Code: 12423   **0 0 3 1.5**

LOGIC CIRCUITS AND MICROPROCESSOR LAB

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. Develop programs in Assembly Language to solve the problems.
4. Understand the storage allocation of data and programs in memory and registers.

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.

Week 2: Implement the following experiments using Logic gates and IC's
    a. Design a 2x4 and 3x8 decoder   b. Design 4x1 and 8x1 MUX.

Week 3: Implement the following experiments using Logic gates and IC's
    a. Design a 3 to 8 decoder.   b. Design a 4-bit comparator.

Week 4: Implement the following experiments using Flip-flops
    a. Design a 4-bit shift register.   b. Design a decade counter.

Week 5: 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 and 16-bit binary numbers as b, c, d, e, k, u, v, w, x and y.

Week 6: Write an ALP of 8086 to take N numbers as input and arrange them in ascending and descending order.

Week 7: Write an ALP of 8086 to take N numbers as input and do the following operations on them a. Find max and minimum. b. Find average

Week 8: 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 9: Write an ALP of 8086 to take a string as input and find whether given string is substring or not.

Week 10: Write an ALP of 8086 to take a number as input and find the factorial using a procedure call.

Week 11: 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 12: Write an ALP of 8086 to take a number as input and say whether it is an Armstrong number or not using procedure call.

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, PHI, 2013.
2. Douglas V. Hall, Microprocessor and Interfacing, 2nd Edition, Tata McGraw-Hill Education.

Online Resources:
1. 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. Create programs in Assembly language to solve the problems using 8-bit & 16-bit numbers.
4. Understand the importance of processor registers, memory allocation.
5. Recognize the representation of data and addressing modes.

II Year B.Tech. CST II-Semester   **L T P C**
Course Code: 12422   **2 0 0 -**

HUMAN VALUES AND PROFESSIONAL ETHICS
(Mandatory Course)
(Common to EEE, ECE, CSE, IT, ETE, CST, CSM & CSD)

Prerequisites: -Nil-

Course Objectives:
1. To instill among the Engineering professionals, the need to follow ethical principles in life.
2. To stimulate thinking and help internalize the value systems and ethical behavior.
3. To enable the students to understand the need for value based education.
4. To inculcate a sense of moral responsibility and professional ethics as Engineers.
5. To understand the impact of ethical perspectives globally.

UNIT 1: (~7 Lecture Hours)
UNDERSTANDING VALUE EDUCATION

Basic Concepts: Moral and Morality, Ethics, Values, Principles – Thoughts of Ethics: Indian Thought versus Global Thought – Objectives of Value Education – Importance of Value Education – Personal Ethics – Professional Ethics.

UNIT 2: (~7 Lecture Hours)
UNDERSTANDING THE HARMONY AT VARIOUS LEVELS

Harmony in the Self – Harmony in the Family – Harmony in the Society – Harmony in the Nature – Harmony in Existence – Understanding the Interconnectedness and Mutual fulfilment – Understanding Existence as Co-existence – CASE STUDIES.

UNIT 3: (~6 Lecture Hours)
ETHICAL THEORIES

Utilitarian Ethics – Kant's Deontological Theory – Virtue Ethics – Kohlberg's Levels of Moral Development – Gilligen's Theory - CASE STUDIES

UNIT 4: (~6 Lecture Hours)
PROFESSIONAL ETHICS

Profession and Professionalism – Ethics in Engineering – Role of Engineers – Responsibilities of Engineers – Engineering Code of Ethics – Ethical Dilemmas – CASE STUDIES

UNIT 5: (~6 Lecture Hours)
GLOBAL ISSUES AND ETHICAL PERSPECTIVES

Business Ethics – Environment Ethics – Computer Ethics – Media Ethics – Research Ethics – Intellectual Property Rights – Social Responsibility – CASE STUDIES

Text Books:

1. A foundation course in Human Values and Professional Ethics by RR Gaur, R.Sangal and G.P.Bargaria,Excel Books, 2011.

2. Human Values and Professional Ethics by Tanu Shukla, Anupam Yadav, Gajendra Singh Chauhan, Cengage Publications, 2018.

Reference Books:

1. Fundamentals of Ethics for Scientists and Engineers by Edmund G, SeeBauer, Robert L, Barry Oxford University Press, 2015.

2. Professional Ethics by R. Subramanian, Oxford University Press, 2013.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc22_mg54/preview
    Ethics in Engineering Practice by Prof.Susmita Mukhopadhyay, IIT Kharagpur]

2. https://nptel.ac.in/courses/109104068 [Exploring Human Values by Prof.A.K.Sharma, IIT Kanpur]

Course Outcomes:

After completion of the course, students will be able to

1. Understand the importance of imbibing and inhering Ethics and values as an individual and professional

2. Relate the need for establishing harmony at various levels.

3. Evaluate the relevance of ethical values in their academic and professional environment.

4. Develop right understanding about oneself and the rest of reality through self-exploration.

5. Identify the basis for universal human values based on right understanding providing the vision for the holistic way of living.

6. Value oneself as professionals with professional ethics and right code of conduct and behaviour in the working environment.

Assessment Criteria:

SATISFACTORY PARTICIPATION CERTIFICATE shall be issued only after securing greater than or equivalent to **75%** of the attendance in the course along with the active Classroom interaction and participation by the students.

PROGRAM EDUCATIONAL OBJECTIVES:

PEO-1	Providing students with a compelling foundation in Engineering and Basic Sciences that will further help them conduct investigations of complex problems.
PEO-2	Applying Scientific and Engineering methodologies using modern tools and techniques in the analysis, design, and development of novel systems in the field of Computer science and Technology.
PEO-3	Promoting lifelong learning in students and help them evolve as self-motivated and responsible professionals with progressive thinking to serve the industry and society in a better way.
PEO-4	Inculcating strong communication skills to interact individually and in multidisciplinary teams and collaborate to excel in various environments with professional ethics, social awareness and environmental concern.

PROGRAM OUTCOMES (POs) – B.TECH. (CST)

PO1	**Engineering Knowledge:** To acquire firm knowledge of Mathematics, Science, Engineering & Computer Science.
PO2	**Problem Analysis:** To identify, formulate & analyze requirements of IT Applications.
PO3	**Design & Development Solutions:** To effectively apply engineering principles to the design of computer & IT based Systems.
PO4	**Investigation of complex problems:** To synthesize research based knowledge in the design of programming and analysis of data for providing valid conclusions to complex problems.
PO5	**Modern Tool Usage:** To possess skills for creating and selecting modern software development tools.
PO6	**Engineering & Society:** To apply conceptual knowledge relevant to professional engineering practices in societal, health, safety, legal and cultural issues and their consequences.
PO7	**Environment & Sustainability:** To understand the impact of engineering solutions in social and economic environments and work towards sustainable development.
PO8	**Ethics:** To understand contemporary legal, social & ethical issues in computing.
PO9	**Individual & Team work: T**o effectively work as an individual and adapt to a team environment.
PO10	**Communication:** To communicate precisely and effectively both in oral and written in all engineering activities.
PO11	**Project management & finance:** To apply engineering and management principles for managing and leading economically feasible projects in multi-disciplinary environments as an individual and team member.
PO12	**Life Long Learning:** To develop confidence to engage in independent & life long learning in the context of Technological changes.

PROGRAM SPECIFIC OUTCOMES (PSOs) – B.TECH. (CST)

PSO1	Understand, analyze and develop efficient software solutions related to algorithms, system software, web applications, data processing and networking by applying fundamental concepts of computer science and Technology.
PSO2	Adapt the emerging technologies in computing and embrace the best practices of software and hardware development to get expertise in modern software and hardware tools and cater to the real time requirements of the industry and society.

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

INSTITUTE VISION

To become a center of quality education in Engineering and Technology for women empowerment.

INSTITUTE MISSION

- To fulfill the academic aspirations of women engineers for enhancing their intellectual capabilities and technical competency.

- To Leverage Leading – Edge Technologies and cultivate exemplary work culture.

- To facilitate success in their desired career in the field of engineering to build a progressive nation.

INSTITUTE QUALITY POLICY

G. Narayanamma Institute of Technology and Science (For Women), Hyderabad is committed in imparting Quality Education and Training for women empowerment in the field of "Engineering and Technology" and to satisfy applicable requirements through continual improvement of the Quality Management System by facilitating and supporting the staff and students to work as a team in upgrading their knowledge and skill in tune with the industrial and technological developments through a set of Quality objectives.