Academic Regulations
Program structure & Detailed Syllabus
VR22

For

Under Graduate Programme (B. Tech. - CS)

COMPUTER SCIENCE AND ENGINEERING – CYBER SECURITY

Applicable For Batches Admitted From 2022 – 2023)

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY (A)

DUVVADA - VISAKHAPATNAM – 530 049

(An Autonomous Institute, Accredited by NAAC, Affiliated to JNTU-GV, Vizianagaram AP)

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY

(AUTONOMOUS)

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ACADEMIC REGULATIONS
VR 22
B. Tech. Program (CSE-CS)

(PROGRAM CODE: 46)

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY (AUTONOMOUS)
VISAKHAPATNAM
ACADEMIC REGULATIONS for B. Tech. (Regular)
(Applicable for the batches admitted 2022-23 onwards)

The Admissions of the students into B. Tech. course shall be as per the Govt. of Andhra Pradesh rules.

1. Award of B. Tech. Degree

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

 a. Pursue a program of study for not less than four academic years and not more than eight academic years.
 b. For lateral entry scheme admission: Pursue a program of study for not less than three academic years and not more than six academic years.
 c. For the award of a degree, regular candidate has to register for 160 credits and shall secure 160 credits.
 d. Lateral entry candidate has to register for 121 credits from second year onwards and shall secure 121 credits.

2. Programs of Study

The following B. Tech. Programs are offered:

S. No.	Program Code	Program& Abbreviation
01	01	Civil Engineering (CE)
02	02	Electrical and Electronics Engineering (EEE)
03	03	Mechanical Engineering (ME)
04	04	Electronics and Communication Engineering (ECE)
05	05	Computer Science and Engineering (CSE)
06	12	Information Technology (IT)
07	19	Electronics and Computer Engineering (E. Com E)
08	54	Artificial Intelligence and Data Science (AI&DS)
09	43	CSE – Artificial Intelligence
10	44	CSE – Data Science
11	46	CSE – Cyber Security

And any other Programs as approved by the authorities of the Institute from time to time.

3. Registration: A student shall register for courses in each semester as per the courses offered in the specific B. Tech Program.

4. Curricular Program:

The Curriculum of the four-year B. Tech Program has been designed to achieve a healthy balance between theory and laboratory courses and Skills required for Industry. Further, focus is given to develop technical skills, Interdisciplinary skills etc.,

5. Distribution and Weightage of Marks

     i. The performance of a student in each semester shall be evaluated course -wise with a maximum of 100 marks for theory courses and 50 marks for practical course. The project work shall be evaluated for 200 marks.

     ii. For theory course the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End Semester Examinations. Distribution of marks for theory course, practical course and Design/Drawing is detailed below:

5.1. Internal 30 marks for theory course shall be awarded as follows:

   i) MID exams -18 marks
   ii) Continuous assessment - 10 marks
   iii) Attendance – 2 marks

MID marks shall be calculated with 80% weightage for best of the two MIDs and 20% weightage for other MID exam.

5.2. For practical courses (Laboratory): There shall be continuous evaluation during the semester. Each Lab exam is evaluated for 50 marks. 20 marks shall be awarded for internal examination and 30 marks shall be awarded for external examinations.

5.2.1. Internal marks shall be awarded as follows
   i)   Day to day assessment including record– 10 Marks
   ii)   Internal laboratory exam– 10 Marks
5.2.2. External marks shall be awarded as follows
  i) Aim, Theory, Procedure/Program and Experimentation – 15 Marks
ii) Result/Output -5M   iii) Viva-Voce-10 Marks
5.2.3. The semester end examinations shall be conducted by the internal and external examiner

5.3. For the courses having design and/or drawing, (Such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 30 marks for internal evaluation.

5.3.1. Internal marks shall be awarded as follows:

   i) Mid exam - 18 marks
   ii) Day-to-day assessment - 10 marks
   iii) Attendance - 2 marks

There shall be two Mid examinations in a semester and the marks shall be calculated with 80% weightage for best of the two Mids and 20% weightage for other Mid exam.

5.3.2. External examination shall be conducted for 70 marks.

5.4. Special Courses:

5.1.1. Engineering Exploration (EE) course:

EE course is evaluated for 50 marks.

i) Internal 20 marks shall be awarded based on the day-to-day performance of the activities.

ii) External evaluation shall be conducted for 30 marks.
- Project submission – 20 marks
- Viva-Voce – 10 marks

5.1.2. **Games, Sports & Yoga:** Though this course has no credits, it is mandatory to satisfy attendance requirements.

5.5. Mini project (EPICS): It is to be carried out during the second year. Students have an option to choose their own area of interest related to problems impacting the society. It is evaluated for 50 marks.

  i) **Internal assessment - 20 marks   ii) Project submission and Viva-Voce - 30 marks**

5.6. Evaluation of the summer internships:

It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs in the area of concerned specialization of the UG programme.

The minimum duration of this course shall be at least 2-4 weeks.

A supervisor/mentor/advisor has to be allotted to guide the students for taking up the summer internship. The supervisor shall monitor the attendance of the students while taking up the internship.

After successful completion, students shall submit a summer internship technical report to the concerned department and appear for an oral presentation before the departmental committee consists of Head of the Department, supervisor of the internship and a senior faculty member of the department. A certificate from industry/skill development center shall be included in the report. It shall be evaluated for 50 external marks at the end of the semester. The technical report and the oral presentation shall carry 20 marks and 30 marks respectively. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted.

5.7. Skill oriented courses

The skill-oriented courses may be registered at the college or at any accredited external agency. The course will be evaluated for 50marks.

a) Day to Day Assessment -20 marks

b) Final Assessment – 30 marks

If the student completes skill-oriented course at external agency, a certificate from the agency to be submitted.

Note: Skill-oriented courses may change from time to time based on requirement

5. 8. Audit courses: All audit courses will be "Pass/Fail" type with no credit points allotted. The result of the student in the audit course will be notified in the marks memo. A student must pass four audit courses registered for the award of B. Tech. degree.
The following audit courses are compulsory.
a) Professional Ethics & Universal Human Values b) Constitution of India c) Game, sports and yoga

List of other audit courses will be notified from time to time. An indicative list of courses is as shown below.
a) Life skills b) Psychometric etc.,

5.9. MOOCs: It is an online course (Minimum of 12 weeks) to promote advanced knowledge suitable for placement and research.

To award credits, the student should get certificate after they have registered for written exam and successfully passed

(Or)

College will conduct the written examination/Viva-voce and award the credits and grades.

In case a student fails in any online course, he/she may be permitted to register for the same course or an alternate course decided by the department committee. The internal marks secured earlier will be nullified if the course is changed. The assessment procedure of MOOCs course remains same as general theory course.

Note: The registered course must not be same as any of the courses listed in the program structure of their regulation till final year including electives.

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

Evaluation: The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks (Report:15marks, Seminar:15marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination

conducted in the presence of internal examiner and external examiner and is evaluated for 140marks.

5.11 Integrated theory lab:
a) The integrated course is in the ratio of 2:1 (total credit:3).
b) Attendance shall be counted for both in theory as well as lab. Minimum attendance shall be required individually in theory and lab as per institute norms
c) Student has to attend the internal examination and external examination conducted by the institution as per the regulations.
d) Student has to pass individually both the external examinations (Theory for 100 marks and Lab for 50 marks)
e) If the student fails in either theory or laboratory, the final result is FAIL only.
f) The student has to pass separately both in the external theory examination and external lab examination

6. Attendance Requirements:

a. It is desirable for a candidate to have 100% attendance in the class in all the courses. However, a candidate shall be permitted to appear for the end semester examination if he/she has a minimum of 75% aggregate attendance in the semester. Student will not be permitted to write Mid examination if the attendance percentage is less than 75 % during the stipulated instruction duration. However, Academic Committee shall review the situation and take appropriate decision.
Note: Special cases for students having extraordinary performance at National and International level will be considered by the Academic Committee.

b. Condonation of shortage of attendance may be considered on Medical grounds maximum up to 10%, if the student provides the medical certificate to the HOD immediately after he / she recovers from the illness. Medical Certificate submitted afterwards shall not be permitted. Shortage of attendance equal to or above 65% and below 75%will be condoned on payment of fee as fixed by the competent authority and the student concerned will be permitted to take the end semester examination. *This privilege is given only three times for regular student and only two times for lateral entry student during the entire program of study*.

c. Shortage of attendance may be considered for the students who participate in prestigious sports, co and extra-curricular activities if their attendance is in the minimum prescribed limit.

d. A student will be promoted to the next semester if satisfies attendance and credits requirement.

7. Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements.

For any course, student is considered to be passed upon securing minimum 40% marks in the external examination alone and minimum 50% marks from both internal and external examination put together

8. Promotion Policy:

a)   A student shall be promoted from first year to second year if he fulfills the minimum   attendance requirements.

b) To promote to III year, a student has to secure minimum 40% of total credits from I &II-year courses

c) To promote to IV year, a student has to secure minimum 40% of total credits from I, II &III-year courses

d) In case of Lateral entry students, to promote to IV year, a student has to secure minimum 40% of total credits from II & III-year courses

9. GAP Year: Gap year concept is introduced after completion of the I/II/III year to give the opportunity to explore entrepreneurship full time. This period shall be counted for the maximum time for graduation. An evaluation committee at Institute level shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for availing Gap year.

10. Supplementary examinations: Supplementary examinations for the odd Semester shall be conducted with the regular examinations of even semester and vice versa. In case a student fails in online courses/ industrial lecture(s), he/she may be permitted to register for another course/lecture(s).

11. Examinations and Evaluation

a. General guidelines
  i.   All the semester end examinations are conducted for duration of three hours
  ii.   External examination shall be conducted for 70 marks consist of five questions of internal choice carrying 12 marks each.
  iii. For laboratory examinations, the evaluation is done by internal examiner and an external examiner.

b. Revaluation

There is a provision for revaluation of theory courses if student fulfils the following norms.

The request for revaluation must be made in the prescribed format duly recommended by the Chief Superintendent of Examinations through Additional Controller along with the prescribed revaluation fee.

12. Grading System:

CGPA

Marks Range (in %)	Letter Grade	Level	Grade Point
≥ 90	O	Outstanding	10
≥80 to <90	A	Excellent	9
≥70 to <80	B	Very Good	8

≥60 to <70	C	Good	7
≥50 to <60	D	Satisfactory	6
<50	F	Fail	0
	AB	Absent	-1
	WH	Withheld	-2
	MP	Malpractice	-3
	CP	Completed	

Computation of SGPA

The following procedure is to be adopted to compute the Semester Grade Point Average. (SGPA) and Cumulative Grade Point Average (CGPA):

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

SGPA $(S_i) = \Sigma(C_i \times G_i) / \Sigma C_i$

Where C_i is the number of credits of the ith course and G_i is the grade point scored by the student in the ith course.

Computation of CGPA

- The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

$$CGPA = \Sigma(C_i \times S_i) / \Sigma C_i$$

Where S_i is the SGPA of the ith semester and C_i is the total number of credits in that semester.

Conversion of CGPA to Percentage:

Equivalent Percentage = (CGPA – 0.75) X 10

13. Award of Class

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

Regular:

Class Awarded	CGPA to be secured	From the CGPA secured
First Class with Distinction	≥ 7.75 with no failures	

First Class	≥ 6.75	**from160 Credits.**
Second Class	≥ 5.75 to < 6.75	

Lateral- entry scheme

Class Awarded	CGPA to be secured	From the CGPA secured from121 Credits from II Year to IV Year
First Class with Distinction	≥ 7.75 with no failures	
First Class	≥ 6.75	
Second Class	≥ 5.75 to < 6.75	

14. General Instructions

   i.   Where the words 'he', 'him', 'his', occur, they imply 'she', 'her', 'hers', also.

  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 Chairman, Academic Council is final.

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

15. Transitory Regulations

   i.   The student has to continue the course work along with the regular students of the respective semester in which the student gets re-admission.

  ii.   The student has to register for Substitute / Compulsory courses offered in place of courses studied earlier.

 iii.   The mode of internal evaluation and end-semester examinations shall be on par with the regular students, i.e., the student has to follow the mode of internal evaluation and the then question paper model for the end-semester examinations along with the regular students of the respective semester in which the student gets re-admission. The marks secured in the internal and end-semester examinations will be pro-rated in accordance with the regulations under which the student was first admitted.

  iv.   For the courses studied under earlier regulations but failed, the student has to appear, pass and acquire credits from the supplementary examinations as and when conducted. The question paper model shall remain same as the one in which the student took examination during previous regulations.

   v.   The promotion criteria based on attendance as well as credits shall be in accordance with the regulations under which the student was first admitted.

vi. All other academic requirements shall be in accordance with the regulations under which the student was first admitted.

vii. The decision of the Principal is final on any other clarification in this regard.

viii. Transcripts: After successful completion of the entire program of study, a transcript containing performance of all academic years will be issued as a final record. Partial transcript will also be issued up to any point of study to a student on request, after payment of requisite fee.

16. Minimum Instruction Days

The minimum instruction days for each semester shall be 16 weeks

There shall be no branch transfers after the completion of the admission process.

17. Withholding of Results

If the student has not paid the dues, if any, to the Institute or in any case of indiscipline is pending against him, the result of the student will be withheld. His degree will be withheld in such cases.

Note: All other regulations including attendance requirements related to four year B. Tech Regular program will be applicable for B.Tech. Lateral Entry Scheme.

18. Malpractices Rules

DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

S. No	Nature of Malpractices/ Improper conduct	Punishment
1 (a)	If the candidate 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 course of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course only.
(b)	If the candidate gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate	Expulsion from the examination hall and cancellation of the performance in that course only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered

	or persons in or outside the exam hall in respect of any matter.	against him.
2	If the candidate has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
3	If the candidate impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the courses of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4	If the candidate smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	If the candidate uses objectionable, abusive or offensive language in the	Cancellation of the performance in that course.

	answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	
6	If the candidate 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 course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7	If the candidate 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 course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8	If the candidate possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall

		not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the college, expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and. a police case will be registered against them.
10	If the candidate comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses 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 course and all other courses the candidate has appeared including practical examinations and project work of that semester/year examinations.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Academic committee of the Institute for further action to award suitable punishment.	

19. UGC RECOMMENDED PUNISHMENT FOR RAGGING

i. Suspension from attending classes and academic privileges
ii. Withholding/withdrawing scholarships/fellowship and other benefits.
iii. Debarring from appearing in any test/examination or other evaluation process
iv. Withholding results
v. Debarring from representing the institution in any regional, national or international meet, tournament, youth festival etc.
vi. Suspension/expulsion from the hostel

vii.   Cancellation of admission

viii.   Rustication from the institution for period ranging from 1 to 4 semesters.

ix.   Expulsion from the institution and consequent debarring from admission to any other institution for a specified period.

x.   Fine may extend up to Rs. 2.5 lakh.

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VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY (AUTONOMOUS) VISAKHAPATNAM

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Guidelines for B. Tech Honors - B. Tech (Hons)

(Applicable from the Academic Year 2022-23 (VR22))

Award of B. Tech. (Honors): All the students pursuing regular B. Tech with prerequisite CGPA are eligible to the register Honors degree course. A student has to acquire 20 more credits, in addition to 160 credits required, for the award of the B. Tech Honors degree. The additional courses shall be advanced courses in the concerned department/discipline. The department concerned will determine required courses for award of Honor degree. The courses in the Honor degree would be a combination of core (theory and lab) and some electives.

OBJECTIVES

The objectives of initiating the B. Tech (Honors) degree certification are:

a) To encourage the undergraduates towards higher studies and research

b) To prepare the students to specialize in core Engineering streams

c) To attain the high-level competence in the specialized area of Under Graduate programme

d) To learn the best educational and professional skills in the specialized area after the completion of his undergraduate courses.

e) To provide the opportunity to learn the post graduate level courses in the specified undergraduate programme

APPLICABILITY AND ENROLMENT

a)   To all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology from Academic year 2022-23.

b) The Honors degree will be offered at five departments (CE/ME/CSE/ECE/EEE/IT).

The department offering Honors shall have at least one M. Tech Program in concerned stream, for B. Tech (Honors)registration.

c) Total number of seats offered for a Honors programme shall be a maximum of 35% of sanctioned intake of major degree programme.

d) The allotment of seat into Honors degree is based on the CGPA obtained in the major degree programme. CGPA shall be taken up to III semester (II Year – I Semester) in case of regular entry students and only III semester in case of lateral entry students

e) In the event of any tie during the seat allotment for a Honors degree, the concerned major degree department offering Honors shall conduct a test/interview on the prerequisite courses of Honors degree and final decision shall betaken.

f) For applicability of Honors degree, both regular B Tech and Honors degree courses shall be successfully completed with specified SGPA/CGPA

g) A student shall report the concerned Principal of the college, if he/she is not interested to pursue/continue the Honors degree programme. Transfer of credits from a particular Honor to regular B. Tech or another major degree and vice-versa shall not be permitted

h) Institutions having at least two NBA accredited B. Tech/M. Tech programs can offer B. Tech (Honors). The program should have valid NBA accreditation at the time of registration of the student for B. Tech (Honors).

ENTRY LEVEL

(a) The B. Tech students (both Regular and Lateral Entry) pursuing a major degree programme can register for Honors degree at their choice in the same department offering major degree from III semester onwards

(b) Students registering for Honors degree shall select the courses from same branches/department based on the recommendations of BOS committee. For example, if a student pursuing major degree in Electrical & Electronics Engineering shall select courses in Electrical & Electronics Engineering only and he/she will get major and Honors degree in Electrical & Electronics Engineering

(c) Only those students, who have a CGPA of 8.0 or above, without any backlog, will be permitted to register for a Honors degree

(d) An SGPA or CGPA in excess of 8.0 has to be maintained in the subsequent semesters in major as well as Honors degree without any backlogs in order to keep the Honors degree registration active.

(e) Should both the SGPA and CGPA fall below 8.0 at any point after registering for the Honors; the Honors degree registration will cease to be active.

(f) A student registered for Honors degree in a discipline must register and pass in all courses with a minimum CGPA of 8.0 that constitute requirement for award of Honors degree.

(g) Separate SGPA/CGPA shall be shown on semester and final transcripts of regular B. Tech and Honors.

(h) Students shall not be permitted to register for Honors degree after completion of VI semester.

(i) Students shall be permitted to select a maximum of two courses per semester from the list of courses specified for Honors degree.

(j) The students shall complete Honors degree without supplementary appearance within stipulated period as notified by Institution for the completion of regular major B. Tech programme.

(k) Honors degree shall not be awarded at any circumstances without completing the regular major B. Tech programme in which a student got admitted

(l) If a student is detained due to lack of attendance, he/she shall not be permitted to register the courses for Honors degree

(m) If a student failed in any registered course of the Honors, he/she shall not be eligible to continue the B. Tech Honors. However, the additional credits and grades thus far earned by the student shall be included in the grade card but shall not be considered to calculate the CGPA.

(n) The courses completed under Honors degree programme shall not be considered as equivalent courses in case the student fails to complete the major degree programme

(o) Students completed their degree shall not be permitted to register for Honors degree

STRUCTURE OF HONORS IN B. TECH

(a) The student shall earn at least 20 credits for award of Honors degree from same

branch/department/discipline registered for major degree

(b) Students can complete Honors degree courses either in the college or online from platforms like NPTEL/SWAYAM etc.

(c) Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses list in the departments, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two NPTEL, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of studies.

(d) The overall attendance in each semester of regular B. Tech courses and Honors degree courses shall be computed separately

(e) A student shall maintain an overall attendance of 75% in all registered courses of Honors to be eligible for attending semester end examinations. However, condonation for shortage of attendance between 65-75% may be given as per norms. On the recommendations of College Academic Council, the student concerned will be permitted to take the semester end examinations, on payment of condonation fee

(f) Student having less than 65% attendance in Honors courses shall not be permitted for semester end examinations.

(g) A student detained due to lack of attendance in regular B. Tech programme shall not be permitted to continue Honors programme

(h) The teaching, examinations (internal and external) and evaluation procedure of Honors degree courses offered in offline is similar to regular B. Tech courses

(i) Students may choose theory or practical courses to fulfil the minimum credit requirement.

(j) Students shall be allowed to take maximum two courses per semester pertaining to their Honors degree

(k) The students registered for minor shall not be permitted to register for B. Tech (Honors)

CREDITS REQUIREMENT

(a) A Student will be eligible to get B. Tech (Honors), if he/she completes an additional 20 credits. These may be acquired either in offline or online like NPTEL/SWAYAM

(b) The colleges offering Honors degree courses shall be ready to teach the courses in offline at their college in the concerned departments. Curriculum and the syllabus of the courses shall be approved by the Board of Studies

(c) The online NPTEL/SWAYAM courses selected by a student shall be approved by concerned BOS. The duration of courses shall be a minimum of 12 weeks.

(d) The assessment and certification of the NPTEL shall be as per the prescribed norms of the NPTEL.

(e) Students shall produce a certificate issued by the NPTEL/SWAYAM conducting agency as a proof of credit attainment.

(f) The teaching and evaluation procedure of Honors courses offering in offline mode shall be similar to that of regular B. Tech courses

(g) After successful completion of all major and Honors degree courses with specified CGPA the Institute will award B. Tech(Honors)

(h) If a student fails to complete a course offered in online/offline, he/she will not be permitted to continue the Honors degree

PROCEDURE TO APPLYING FOR HONORS DEGREE

(a) The department offering the Honors should announce courses required before the start of the session.

(b) The interested students shall apply for the Honors course to the HOD of the concerned department

(c) The concerned department should announce the list of the selected students for the Honors.

(d) The whole process should be completed within one week before the start of every session.

(e) Selected students shall be permitted to register the courses for Honors degree.

JOINING IN HONOR COURSES IN B. TECH

(a) Each department offering the Honors degree shall submit the final list of selected students to the principal.

(b) The selected students shall submit a joining letter to the Principal through the concerned HOD.

(c) The department offering Honors shall maintain the record of student pursing the

Honors degree

(d) With the approval of Principal and suggestion of advisor/mentor, students can choose courses from the approved list and shall register the courses within a week as per the conditions laid down in the structure for the Honor degree.

(e) Each department shall communicate the Honors courses registered by the students to the time table drafting committee and accordingly time table will be drafting. Time table drafting committee shall see that no clash in timetables.

(f) If the student wishes to withdraw/change the registration of subject/course, he/she shall inform the same to advisor/mentor, course teacher, HOD and Principal within two weeks after registration of the course.

PROCEDURE FOR MONITORING THE PROGRESS OF THE SCHEME

The students enrolled in the Honor courses will be monitored continuously at par with the prevailing practices and examination standards. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.

ALLOCATION OF SEATS FOR HONORS DEGREE

(a) The Institute will notify the number of the seats for Honors degree in each department well in advance before the start of the semester

(b) Total number of seats offered for Honors degree shall be a maximum of 35% of sanctioned intake of major degree programme.

(c) Each department of concerned institute will notify the seats for the Honors well before the start of each session as per the following Table

S. No	Name of the course	Sanction seats of major degree programme	Seats offered for Honors	Courses offered	Credits for each course

COURSE FEES FOR REGISTRATION OF COURSES IN MAJOR DEGREE

There is no fee for registration of courses for major degree programme offered in offline at the respective colleges.

EXAMINATIONS

(a) The examination for the Honors degree courses offered in offline shall be conducted along with regular B. Tech programme.

(b) The examinations (internal and external) and evaluation procedure of Honors degree courses offered in offline is similar to regular B. Tech courses.

(c) A separate transcript shall be issued for the courses passed in each semester

(d) There is no supplementary examination for the failed courses in a Honors degree programme.

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY (AUTONOMOUS) VISAKHAPATNAM

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Guidelines B. Tech Minors in Engineering

(Applicable from the Academic Year 2022-23 (VR22))

Award of B. Tech. (Minor): A student has to acquire 20 more credits, in addition to 160 credits required, for the award of the minor. The department concerned will determine the required courses for award of minor. The courses in minor programme would be a combination of mostly core and some electives.

Registering for Minor is optional.

I. OBJECTIVES

The objectives of initiating the minor certification are:
(a) To diversify the knowledge of the undergraduates.
(b) To make the undergraduates more employable.
(c) To have more educational and professional skills after the completion of his undergraduate courses.
(d) To give a scope to specialize students in other streams of engineering in addition to the ones they are currently pursuing.

II. Applicability and Enrolment

(a) To all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology from academic year 2022-23. The degree will be offered at nine departments (CE/EEE/ME/ECE/CSE/IT/ECM/AI&DS/MBA).

(b) There shall be no limit on the number of programs offered under Minor. The minor programs in emerging technologies based on expertise in the respective departments may be offered and minor can also be offered in collaboration with the relevant industries/agencies.

(c) Total number of seats offered for a minor programme shall be a maximum of 35% of sanctioned intake of major degree programme.

(d) If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

(e) The allotment of seat into minor is based on the percentage of marks obtained in the major degree programme. Percentage of marks shall be taken up to III semester in case of regular entry students and only III semester in case of lateral entry students

(f) In the event of any tie during the seat allotment for a minor, the concerned major degree department offering minor shall conduct a test/interview on the prerequisite courses of minor and final decision shall be taken.

(g) For acquiring minor degree, both regular B Tech and minor courses shall be successfully completed with specified SGPA/CGPA

(h) A student shall report the concerned Principal of the college, if he/she is not interested to pursue/continue the minor programme.

(i) Transfer of credits from a particular minor to regular B. Tech or another major

degree and vice-versa shall not be permitted

III. *Entry level*

(a) The B. Tech students (both Regular and Lateral Entry) pursuing a major degree programme can register for minor at their choice in any other department offering minor from III semester (II Year – I Semester) onwards.

(b) Students registering for minor shall select the courses from other branches. For example, if a student pursuing major degree in Electrical & Electronics Engineering shall select the courses specified for minor in Civil Engineering and he/she will get major degree of Electrical & Electronics Engineering with minor of Civil Engineering.

(c) Student pursuing major degree in any engineering branch is eligible to register for minor in any other engineering branch. However, students pursuing major degree in a particular Engineering are not allowed to register for minor in the same engineering branch.

(d) Only those students, who have a CGPA of 7.75 or above, without any backlog, will be permitted to register for a minor.

(e) An SGPA or CGPA in excess of 7.75 has to be maintained in the subsequent semesters in major as well as minor without any backlogs in order to keep the minor registration active.

(f) Should both the SGPA and CGPA fall below 7.75 at any point after registering for the minor; the minor registration will cease to be active.

(g) Separate CGPA shall be shown on semester and final transcripts of regular B. Tech and minor.

(h) Students shall not be permitted to register for minor after completion of VI semester.

(i) Students shall be permitted to select a maximum of two courses per semester from the list of courses specified for minor.

(j) The students shall complete minor without supplementary appearance within stipulated period for the completion of regular major B. Tech programme.

(k) Minor shall not be awarded at any circumstances without completing the regular major
B. Tech programme in which a student got admitted

(l) If a student is detained due to lack of attendance, he/she shall not be permitted to register the courses of minor

(m) If a student failed in any registered course of the minor, he/she shall not be eligible to continue the B. Tech minor. However, the additional credits and grades thus far earned by the student shall be included in the grade card but shall not be considered to calculate the CGPA.

(n) The courses completed under minor programme shall not be considered as equivalent courses in case the student fails to complete the major degree programme

(o) Students completed their degree shall not be permitted to register for minor

IV. *Structure of Minor in B. Tech*

(a) The student shall earn at least 20 credits for award of minor from other

branch/department/discipline registered for major degree.

(b) Students can complete minor courses either in the college or in online from platforms like NPTEL/SWAYAM etc.

(c) The overall attendance in each semester of regular B. Tech courses and minor courses shall be computed separately

(d) A student shall maintain an overall attendance of 75% in all registered courses of minor to be eligible for attending semester end examinations. However, condonation for shortage of attendance between 65-75% may be given as per norms. On the recommendations of College Academic Council, the student concerned will be permitted to take the semester end examinations, on payment of condonation fee.

(e) Student having less than 65% attendance in minor courses shall not be permitted for end semester examinations.

(f) A student detained due to lack of attendance in regular B. Tech programme shall not be permitted to continue minor programme

(g) The teaching, examinations (internal and external) and evaluation procedure of minor courses offered in offline is similar to regular B. Tech courses

(h) The students may choose theory or practical courses to fulfil the minimum credit requirement.

(i) The students may be allowed to take maximum two courses per semester pertaining to their minor

(j) The students are permitted to opt for only a single minor course in his/her entire tenure of B. Tech (Engineering)

(k) The students registered for B. Tech (Hons) shall not be permitted to register for minor

(l) The student is not permitted to take the electives courses from the parent department fulfil the minimum credit requirement.

V. *Credits requirement*

(a) A Student will be eligible to get minor along with major degree engineering, if he/she completes an additional 20 credits. These may be acquired either in offline or online like NPTEL/SWAYAM

(b) Of the 20 additional credits to be acquired, 16 credits shall be earned by undergoing specified courses of minor, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two NPTEL, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12 weeks as recommended by the Board of studies.

(c) The colleges offering minor courses shall be ready teach the courses in offline at the college in the concerned departments. Curriculum and the syllabus of the courses shall be approved by the Board of Studies

(d) The online NPTEL/SWAYAM courses selected by a student shall be approved by concerned BOS. The duration of courses shall be a minimum of 12 weeks and the courses should not be part of the VR 20 Curriculum.

(e) The teaching and evaluation procedure of minor courses offering in offline mode shall be similar to that of regular B. Tech courses

(f) Students shall produce a certificate issued by the NPTEL/SWAYAM conducting agency as a proof of credit attainment

(g) The assessment and certification of the NPTEL shall be as per the prescribed norms of the NPTEL.

(h) After successful completion of all major and minor courses with specified CGPA the Institute will award both major and minors

(i) If a student fails to complete a course offered in online/offline, he/she will not be permitted to continue the minor

VI. *Procedure to Applying for the Minor*

(a) The department offering the minor should announce specialization and courses before the start of the session.

(b) The interested students shall apply through the HOD of his/her parent department.

(c) The concerned department should announce the list of the selected students for the minor.

(d) The whole process should be completed within one week before the start of every session.

(e) Selected students shall be permitted to register the courses for minor.

VII. *Registering for minor courses*

(a) Each department offering the minor will submit the final list of selected students to the principal.

(b) The selected students shall submit a joining letter to the Principal through the concerned HOD offering the minor. The student shall inform same to the HOD of his/her parent department.

(c) Both parent department and department offering minor shall maintain the record of student pursing the minor

(d) With the approval of Principal and suggestion of advisor, students can choose courses from the approved list and shall register the courses within a week as per the conditions laid down in the structure for the minor.

(e) Each department shall communicate the minor courses registered by the students to the time table drafting committee and accordingly time table will be drafting. Time table drafting committee shall see that no clash in timetables.

(f) If the student wishes to withdraw/change the registration of subject/course, he/she shall inform the same to advisor, course teacher, HODs of minor department and parent department and Principal within two weeks after registration of the course.

VIII. *Procedure for Monitoring the Progress of the Scheme*

The students enrolled in the minor courses will be monitored continuously at par with the prevailing practices and examination standards. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.

IX. *Allocation of seats for minor*

(a) The Institute will notify the number of the seats for minor in the concerned department well in advance before the start of the semester

(b) Total number of seats offered for a minor programme shall be a maximum of 35% of sanctioned intake of major degree programme.

(c) The list of the elective for minor will be offered from the list of running majors in the concerned courses. Each department in the institute will notify the seats for the minor well before the start of each session as per the following Table

S. No	Name of the course	Sanction seats of major degree programme	Seats offered for minor	Courses offered	Credits for each course

X. *Course Fees for registration of Courses in Minor degree*

There is no fee for registration of Courses for minor degree programme offered in offline at the respective colleges.

XI. *Examinations*

(a) The examination for the minor courses offered in offline shall be conducted along with regular B. Tech programme.

(b) The examinations (internal and external) and evaluation procedure of minor courses offered in offline is similar to regular B. Tech courses.

(c) A separate transcript shall be issued for the minor Courses passed in each semester

(d) There is no supplementary examination for the failed Courses in a minor programme.

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY:: VSP

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING –
CYBER SECURITY**

PROGRAM STRUCTURE – VR-22

I B. Tech. I Semester

S. No.	Course Code	Course Title	L	T	P	C
1	1000221102	Calculus	3	1	0	3
2	1000221109	Applied Physics	3	0	0	3
3	1000221107	Technical English Communication	2	0	0	2
4	1003221102	Engineering Drawing	1	0	4	3
5	1005221100	Problem Solving and Programming using C	3	0	0	3
6	1000221112	Technical English Communication Lab	0	0	3	1.5
7	1000221114	Applied Physics Lab	0	0	3	1.5
8	1005221110	Problem Solving and Programming using C Lab	0	0	3	1.5
9	1000221170	Engineering Exploration Lab	0	0	2	1
10	1000221120	Game, Sports and Yoga	2	0	0	0
		Total Credits				**18**

I B. Tech. II Semester

S. No.	Course Code	Course Title	L	T	P	C
1	1000221103	Linear Algebra and Tensors	3	1	0	3
2	1000221206	Probability and Statistics	3	0	0	3
3	1005221201	Programming in modern C++	3	0	0	3
4	1005221202	Computer Organization	3	0	0	3
5	1005221203	Web Design	3	0	0	3
6	1005221211	Programming in C++ Lab	0	0	3	1.5
7	1000221210	R Programming Lab	0	0	3	1.5
8	1005221212	Web Design Lab	0	0	3	1.5
9	1000221121	Constitution of India	2	0	0	0
		Total Credits				**21**

Total Credits (I Year – I & II SEM) = 39

II B. Tech. I Semester

S. No.	Course Code	Course Title	L	T	P	C
1	1000222104	Mathematical Foundations of Cyber Security	3	0	0	3
2	1005221204	Data Structures	3	0	0	3
3	1005222100	Java Programming	3	0	0	3
4	1005222101	Operating Systems	3	0	0	3
5	1005222102	Software Engineering	3	1	0	3
6	1005221213	Data Structures Lab	0	0	3	1.5
7	1005222110	Java programming Lab	0	0	3	1.5
8	1005222111	Operating Systems Lab	0	0	3	1.5
9	1005222180	Skill advanced Course / soft skill course	0	0	4	2
10	1000222120	Environmental Science	2	0	0	0
Total Credits						**21.5**

II B. Tech. II Semester

S. No.	Course Code	Course Title	L	T	P	C
1	1000222100	Discrete Mathematical Structures	3	0	0	3
2	1005222103	Programming Essentials in python	3	0	0	3
3	1005222200	Database Management Systems	3	0	0	3
4	1046222200	Applied Cryptography	3	0	0	3
5		**OPEN ELECTIVE-I:** 1. Microprocessor 2. Industrial waste and waste water management 3.Environmental pollution 4. Renewable Energy Sources	3	0	0	3
6	1005222210	Database Management Systems Lab	0	0	3	1.5
7	1005222113	Programming Essentials in python Lab	0	0	3	1.5
8	1005222280	Skill advanced Course / soft skill course	0	0	4	2
9	1005222270	Mini Project (EPICS)	0	0	2	1
10	1000222121	Life Skills	2	0	0	0
Total Credits						**21**
MANDATORY SUMMER INTERNSHP						

Total Credits (II Year - I & II SEM) = 21.5+21= 42.5

III B. Tech. I Semester

S. No.	Course Title	L	T	P	C
1	Computer Networks	3	0	0	3
2	Design and Analysis of algorithms	3	0	0	3
3	Unix and Shell Programming	3	0	0	3
4	**PROFESSIONAL ELECTIVE-I**	3	0	0	3
5	**OPEN ELECTIVE-II**	3	0	0	3
6	Computer Networks Lab	0	0	3	1.5
7	Algorithms Lab	0	0	3	1.5
8	Unified Modeling Language Lab	0	0	3	1.5
9	Professional Ethics and Universal Human Values	1	0	2	0
10	Skill advanced Course / soft skill course	0	0	4	2
11	Mandatory Summer Internship in Second Year (to be evaluated in III Year – I Semester)	0	0	0	1.5
Total Credits					**23**

III B. Tech. II Semester

S. No.	Course Title	L	T	P	C
1	Vulnerability Analysis and Penetration Testing	3	0	0	3
2	Data Warehousing and Data Mining	3	0	0	3
3	Managerial Economics and Financial Analysis	3	0	0	3
4	**PROFESSIONAL ELECTIVE-II**	3	0	0	3
5	**PROFESSIONAL ELECTIVE-III**	3	0	0	3
6	Vulnerability Analysis and Penetration Testing Lab	0	0	3	1.5
7	Data Mining using Python Lab	0	0	3	1.5
8	Skill advanced Course / soft skill course	0	0	4	2
Total Credits					**20**
MANDATORY INDUSTRIAL/RESEARCH SUMMER INTERNSHP					

Total Credits (III Year - I & II SEM) = 23+20 = 43

IV B. Tech. I Semester

S. No.	Course Title	L	T	P	C
1	Artificial Intelligence and Machine Learning	3	0	0	3
2	**Professional Elective-IV**	3	0	0	3
3	**Professional Elective-V**	3	0	0	3
4	**Open Elective-III**	3	0	0	3
5	**Open Elective-IV**	3	0	0	3
6	**HSS Elective**	3	0	0	3
7	Artificial Intelligence and Machine Learning Lab	0	0	3	1.5
8	Skill advanced Course / soft skill course	0	0	4	2
9	Mandatory Industrial/Research Summer Internship in Third Year (to be evaluated in IV Year – I Semester)	0	0	0	2
Total Credits					**23.5**

IV B. Tech. II Semester

S. No.	Course Title	L	T	P	C
1	Project (Project work, seminar and Internship in Industry)	0	0	0	12
SEMESTER LONG INTERNSHIP (6 MONTHS)					
Total Credits					**12**

Total Credits (IV Year - I & II SEM) = 23.5+12= 35.5

GRAND TOTAL CREDITS: (I Y + IIY +III Y + IV Y) = 39+42.5+43+35.5 = 160

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING –

CYBER SECURITY

PROGRAM STRUCTURE – VR-22

I B. Tech. I Semester

S. No.	Course Code	Course Title	L	T	P	C
1	1000221102	Calculus	3	1	0	3
2	1000221109	Applied Physics	3	0	0	3
3	1000221107	Technical English Communication	2	0	0	2
4	1003221102	Engineering Drawing	1	0	4	3
5	1005221100	Problem Solving and Programming using C	3	0	0	3
6	1000221112	Technical English Communication Lab	0	0	3	1.5
7	1000221114	Applied Physics Lab	0	0	3	1.5
8	1005221110	Problem Solving and Programming using C Lab	0	0	3	1.5
9	1000221170	Engineering Exploration Lab	0	0	2	1
10	1000221120	Game, Sports and Yoga	2	0	0	0
		Total Credits				**18**

I B. Tech. II Semester

S. No.	Course Code	Course Title	L	T	P	C
1	1000221103	Linear Algebra and Tensors	3	1	0	3
2	1000221206	Probability and Statistics	3	0	0	3
3	1005221201	Programming in modern C++	3	0	0	3
4	1005221202	Computer Organization	3	0	0	3
5	1005221203	Web Design	3	0	0	3
6	1005221211	Programming in C++ Lab	0	0	3	1.5
7	1000221210	R Programming Lab	0	0	3	1.5
8	1005221212	Web Design Lab	0	0	3	1.5
9	1000221121	Constitution of India	2	0	0	0
		Total Credits				**21**

Total Credits (I Year – I & II SEM) = 39

I B. TECH - I SEMESTER SYLLABUS

I Year – I Semester	B. TECH – CSE-CS- VR22	L	T	P	C
Course Code : 1000221102	CALCULUS	3	0	0	3

COURSE OBJECTIVES:

1. Familiarize with multi-dimensional coordinate systems and to compute line, surface and volume integrals.

2. To discuss ordinary differential equations.

3. To construct partial differential equations by eliminating arbitrary constants and functions and to solve first order partial differential equations.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	*Apply* various methods to solve 1st order differential equations.	PO1 PO2	2 2
CO2	*Understand* different analytical methods to solve higher order linear differential equations**.**	PO1 PO2	2 2
CO3	*Apply* single and Multiple integration techniques to calculate arc length, areas and volume bounded by region.	PO1 PO2	2 1
CO4	*Understand* solution of first order linear partial differential equations	PO1 PO2	2 2

UNIT- I

FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS:[8 Hours]

Exact differential equations, equations reducible to exact, Linear differential equation, Bernoulli differential equation.

UNIT-II

DIFFERENTIAL EQUATIONS OF HIGHER ORDER: **[10 Hours]**

Non-homogeneous linear differential equations of second and higher order with constant coefficients with non-homogeneous terms of the type $e^{ax}, \sin ax, \cos ax, x^k, e^{ax}V(X), xV(x)$,

UNIT-III

INTEGRAL CALCULUS: [10 Hours]

Double integrals: Double integrals, change of order of integration - change of variables (Polar) - Areas (Cartesian coordinates) and triple integrals – Volumes (Cartesian coordinates)

UNIT-IV

MULTIVARIABLE CALCULUS: [12 Hours]

Functions of several variables –Partial derivatives –Total derivative– Chain rule – Jacobian and functional dependence – Taylor's and Maclaurin's expansion for function two variables-Maxima and Minima: Extreme values and saddle points – constrained maxima and minima – Lagrange's multiplier method.

UNIT-V

PARTIAL DIFFERENTIAL EQUATIONS OF FIRST ORDER: [8 Hours]

Introduction -Solutions of first order linearequations(Lagrange's) and nonlinearequations: standard type $f(p,q) = 0, f(z,p,q) = 0, f(x,p) = g(y,q)$ &Claurits equation.

TEXTBOOKS:

1. Higher Engineering Mathematics by H.K. Dass, 3e, S. Chand Publications.

2. Higher Engineering Mathematics 2e, B. V. Ramana, Tata McGraw Hill Publishing Co. Ltd

REFERENCE BOOKS:

1. Higher Engineering Mathematics – 43rd Edition by Dr. B. S. Grewal, Khanna Publishers.

2. A Textbook of Engineering Mathematics, N. P. Bali, Laxmi Publications (P) Ltd.

3. Advanced Engineering Mathematics, Erwin Kreszig, 8thEd, Wiley Student Edition.

4. Engineering Mathematics, Greenburg, 2nd Ed, Pearson education.

I Year – I Semester	B. TECH – CSE-CS- VR22	L	T	P	C
Course Code : 1000221109	APPLIED PHYSICS	3	0	0	3

COURSE OBJECTIVES:
The objectives of this course is to acquire knowledge on the

i.   To identify the importance of the optical phenomenon i.e., interference, diffraction and polarization related to its Engineering applications.
ii.   Understand the mechanism of emission of light, utilization of lasers as coherent light sources for low and high energy applications, study of propagation of light through optical fibers and their implications in optical communications.
iii. Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of deBroglie matter waves, quantum mechanical wave equation and its application.
iv.   To understand the physics of Semiconductors and their working mechanism.
v.   To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:
CO1	Understand the concepts of physical optics through the wave nature of light and discuss the phenomenal differences between interference and diffraction
CO2	Describe the basic laser physics, working of lasers, and principle of propagation of light in optical fibers.
CO3	Apply the knowledge of basic quantum mechanics, to set up one dimensional Schrodinger's wave equation
CO4	Gain the knowledge of semiconductor bonding, semiconductor carrier properties and describe the concepts of logic gates

UNIT- I

INTEREFERENCE   **[09 Hours]**

Introduction-Principle of Superposition – Interference-Conditions for sustained interference– Coherent Sources – Interference in thin films (reflection geometry) – Newton's rings – Applications of interference.

DIFFRACTION
Introduction – Difference between interference and diffraction – Difference between Fresnel and Fraunhofer diffraction - Fraunhofer diffraction at single slit- cases – Diffraction grating

UNIT-II

LASERS & FIBER OPTICS   **[09 Hours]**
Lasers: Introduction-Characteristics of laser light – stimulated absorption, spontaneous and stimulated emission of radiation – population inversion (2-level, 3-level and 4–level schemes) - Einstein coefficients and significance– basic components of laser - Ruby laser – He- Ne laserand applications of lasers.

Fiber Optics: Introduction and principle of optical fiber – acceptance angle - numerical aperture - Applications of optical fibers.

UNIT- III
QUANTUM MECHANICS
Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

UNIT- IV

SEMICONDUCTOR PHYSICS & INTRODUCTION TO DIGITAL ELECTRONICS
                                                              [10 Hours]
Semiconductor Physics: Introduction - bond formation in intrinsic semiconductors and extrinsic semiconductors (P-type and N-type) – intrinsic electrical conductivity – Drift & Diffusion –Einstein's equation – Hall effect in semiconductors – Applications of Hall effect.
Introduction To Digital Electronics: Logic gates (OR gate, AND gate, NOT gate, NAND gate, NOR gate, XOR gate), Demorgan's theorems, Boolean Expressions with Truth Tables,Product of literals (Min term), Sum of literals (Max term), Sum of products, Product of sums, Laws of Boolean algebra.

UNIT- V

COMBINATIONAL CIRCUITS   **[10 Hours]**

Design procedure of combinational circuits**.**Minimization of logic expressions by algebraic method-Kmapmethod,NAND and NOR implementation. Designing of half adder, full adder, Multiplexers, De-multiplexers, encoders, decoders.

Text Books:

1. L.M. Pedrotti, Introduction to Optics, Prentice-Hall International, Inc. (1993)
2. Resnick , Halliday, Krane,Physics Vol 1& 2 (5ed), Wiley, Fifth edition (2007)
3. M.N. Avadhanulu, P.G.K shirsagar& T.V.S Arun Murthy, A Text book of Engineering Physics, S. Chand Publications, 11th edition, 2019.
4. P. K. Palaniswamy,Engineering Physics, Scitech Publications India Private Limited, 2nd edition, 2009.
5. A.P. Malvino, D.P. Leach, Digital Principles and Applications, Tata McGraw Hill Education Pvt. Ltd. (1995)
6. S. M. Sze,Physics of Semiconductor Devices, 3rd edition, John Wiley & Sons, (2007)
7. Joseph Lindmayer, Charles Y. Wrigly, Fundamentals of Semiconductor Devices, Litton Educational Publishing Inc.(1966)

Reference Books:

1. K. Thyagarajan, Engineering Physics, McGraw-Hill Education (India) Pvt. Ltd, 2016..
2. David J. Griffiths · Darrell F. Schroeter, Introduction to Quantum Mechanics, Cambridge University Press; 3 edition, (2018).
3. R.K. Gaur and S.L. Gupta, Engineering Physics, Dhanpat Rai Publications (P) Ltd, 2015.
4. A.K. Sharma, Semiconductor Electronics, New Age International (P) Limited Publisher, New Delhi. (2011).
5. Dr. D. Thirupathi Naidu, M. Veeranjaneyulu, Engineering Physics, VGS Techno series 6th Edition, 2019

E-Books: (Specify links)

NPTEL/MOOC: (Specify Links)

I Year – I Semester	B. TECH – CSE-CS- VR22	L	T	P	C
Course Code : 1000221107	TECHNICAL ENGLISH COMMUNICATION	3	0	0	3

COURSE OBJECTIVES:

- To introduce students to the specific use of English for Technical Communication.
- To develop the overall English proficiency of students and enable them to function effectively in different professional contexts.
- To strengthen student skills in the areas of reading, writing, listening and speaking and enable them to function effectively in their professional sphere

COURSE OUTCOMES:

CO	At the end of the course, the student will have the ability to:
CO1	Read, understand and interpret material on Social Media, Inventors, Human Values Health and Nutrition and New age Entrepreneurs
CO2	Analyze the functions of language and grammar in spoken and written forms.
CO3	Write effectively on various domains.
CO4	Prepare and exhibit oral presentation skills by using ICT.(Individual/Team)

**Strength of mapping (Intensity Scale) – 1(Lightly mapped), 2(Moderately mapped), 3(Heavily mapped)

UNIT- I

Reading Texts   **:** Social Media

Writing   **:** Email Writing, Letter Writing

Grammar   **:** Functional grammar (Verb-Tense)

Activities   **:** Reading Comprehension, Movie/Book/Article Review Presentation

UNIT-II

Reading Texts   **:** Inventors

Writing   **:** Paragraph writing, Note Making

Grammar   **:** Articles, Prepositions

Activities   **:** Reading Comprehension, Making notes

UNIT-III

Reading Texts   **:** Human Values- War

Writing   **:** Power Point Presentations by using visual aids

Grammar   **:** Subject-Verb Agreement

Activities   **:** Reading Comprehension, Team presentation

UNIT-IV

Reading Texts   **:** Health and Nutrition

Writing   **:** Essay writing, Ad Making

Grammar   : Active and passive voice Direct and Indirect speech

Activities   **:** Reading Comprehension, Brochure Design

UNIT-V

Reading Texts   : New age Entrepreneurs

Writing   **:** Paraphrasing**,** Information Transfer

Grammar   : Common errors

Activity   **:** Reading Comprehension, Grammar Quiz and Information Transfer

Suggested Books   **:**
- English for Technical Communication by N.P.Sudharshana, C.Savitha, Cambridge University Press-2022.

Reference Books   **:**
1. A course in Technical English by D.Praveen Sam, KN. Sobha-Cambridge University Press-2020.
2. The Big Book of English Grammar for ESL and English Learners: Prepositions, Phrasal Verbs, English Articles (a, an and the), Gerunds and Infinitives, Focus on English Grammar Big Book Series) - Thomas Celentano –Paperback-2020
3. English Grammar Rules You Must Know:Writing & Speaking 101 for Beginners, Daily English for friendly Conversation &Business Applications Understanding Grammar to AVOID Errors that make you look DUMB!- Lissie Bradach-2020
4. https://bookauthority.org/books/new-english-grammar-books
5. The Handy Parts of Speech Guide: Enjoy Learning The Basics of Grammar-Elizabeth   O' Brien-2021

6. English Grammar for Writing:Lessons on Sentence Structure- Crystal Wang -2021   7.   TOEFL iBT Reading Section:How To Master NEW TOEFL iBT Reading 2020:

 TOEFL Test Prep-Keisha Benedick-2021.

I Year – I Semester	B. TECH – CSE-CS- VR22	L	T	P	C
Course Code : 1003221102	ENGINEERING DRAWING	1	0	4	3

Course Objectives:

To introduce the use and the application of drawing instruments and to make the students construct the polygons and curves. To introduce orthographic projections and to project the points and lines parallel to one plane and inclined to other. To make the students draw the projections of the plane and solids inclined to one planes. To make the students draw isometric views of simple objects

Course Outcomes:

CO's	Course Outcomes
CO1	Understand the use of drawing instruments to construct the polygons and curves.
CO2	Learn the principle of orthographic projections. Draw Orthographic projections of points, lines.
CO3	Draw the various types of planes and solids its views in different Positions.
CO4	Draw isometric views of simple objects.

UNIT- I

Introduction to Engineering Drawing
Polygons– Construction of regular polygons. Curvesused in Engineering Practice– Ellipse (General method and oblong Method only),Parabola & Hyperbola(General method only) Introduction to Scales– Vernier & Diagonal Scales.

UNIT- II

Orthographic Projections
Projections of points– Projections of straight line– Line parallel to one plane and perpendicularto other plane– parallel to both the planes.
Projections of straight lines– parallel to one plane and inclined to the other plane.
Straight lines inclined to both the planes.

UNIT- III

Projections of Planes
Regular planes perpendicular/parallel to one plane and inclined to the other referencePlane inclined to both the reference planes.

UNIT- IV

Projections of Solids
Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the plane only

UNIT- V

Isometric Projections
Conversion of Isometric Views to Orthographic Views
Conversion of Orthographic Views to Isometric Views.

Text Books:

1. Engineering Drawing, N. D. Bhatt, Chariot Publications.
2. Engineering Drawing, K. L. Narayana & P. Kannaiah, Scitech Publishers
3. Engineering Drawing and Graphics by K Venugopal,New Age international publications .

Reference Books:

1. Engineering Drawing, Agarwal & Agarwal, Tata McGraw Hill Publishers.
2. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age.

I Year – I Semester	B. TECH – CSE-CS- VR22	L	T	P	C
Course Code : 1005221100	PROBLEM SOLVING AND PROGRAMMING USING C	3	0	0	3

COURSE OBJECTIVES:

1. To understand computer programming and its roles in problem solving.
2. To understand and develop well-structured programs using C language.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:
CO1	Write compile and debug Programs in C language
CO2	Use operators, data types and write programs
CO3	Select the best loop construct for a given problem
CO4	Design and implement C programs

UNIT- I

Introduction to computers: Computer systems, computer Languages, computer number systems.

Introduction to C programming: Background and characteristics of C, Flow Charts, algorithms and pseudo code. Structure of a C Program, Input/output Statements in C, writing C programs, compiling and executing C programs.

UNIT- II

Programming Style: Tokens of C, Keywords, Variables, Constants and rules to form variables and constants, Data Types, Declaration of Variables and initialization, Operators, Operator precedence and associativity. Type conversions

Flow of Control: Selection: Two way selection, multi-way selection

Repetition and Unconditional Control Statements: concept of loop ,pre test and post test loops, initialization and updating loops ,while statement, do-while statement, for statements, nested loops, break ,continue, goto.

UNIT- III

Arrays and Strings:

Arrays: One-Dimensional Arrays, Declaration, Array Initialization, Input and Output of Array Values, Two-Dimensional Arrays.

Strings: String Fundamentals, String Input and Output, String manipulation functions.

UNIT- IV

Modular Programming:

Function and Parameter Declarations: Function definition, types of functions, declaration and definition of user defined functions, its prototypes and parameters, calling a function. Arrays as Function Arguments, Variable Scope, storage class, recursive functions. .

UNIT- V

Pointers, Structures, Unions and files:

Pointers: Concept of a Pointer, Initialization of pointer variables, pointers as function arguments, address arithmetic, pointers to pointers, Pointers and arrays, Array of Pointers, parameter passing techniques. Dynamic memory allocation.

Structures and Unions: Structures declaration, Initialization of structures, accessing structures, unions.

Files: Declaring, Opening and closing file streams, Reading from and writing to text files.

Text Books:

1. Programming in C, Reema Thareja, and Oxford.
2. The C programming Language, Brain W.Kernighan, Dennis Ritchie,2e,pearson
3. C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage. Pub. Programming with C, Bichkar, Universities Press.

Reference Books:

1. ANSIC Programming gary J.Bronson, Cengage learning.
2. Let us 'C' by yashwantkanethkar, BPB Publications, 16 edition.

I Year – I Semester	B. TECH – CSE-CS- VR22	L	T	P	C
Course Code : 1000221112	TECHNICAL ENGLISH COMMUNICATION LAB	0	0	3	1.5

COURSE OBJECTIVES:

- To introduce students to the specific use of English for Technical Communication.
- To develop the overall English proficiency of students and enable them to function effectively in different professional contexts.
- To strengthen student skills in the areas of reading, writing, listening and speaking and enable them to function effectively in their professional sphere.

COURSE OUTCOMES:

COs	At the end of the course, the student will have the ability to:
CO1	Analyze the functions of language and grammar in spoken and written forms.
CO2	Write effectively on various domains.
CO3	Prepare and exhibit oral presentation skills by using ICT.(Individual/Team)

**Strength of mapping (Intensity Scale) – 1(Lightly mapped), 2(Moderately mapped), 3(Heavily mapped)

LIST OF EXPERIMENTS

S. No.	Name of the Experiment	Skill
1	Just A Minute –Tell about oneself	Speaking
2	Note Taking	Listening & Writing
3	Role-plays-Interactions	Listening & Speaking
4	Mini Presentation	Speaking
5	Phonetic notation	Speaking
6	Group Discussion	Team work, Leadership Speaking

Reference Books:

1. A course in Technical English by D.Praveen Sam, KN. Sobha-Cambridge University Press-2020.

2. Speak Well, Editors-K.Nirupa Rani, Jayashree Mohan Raj, Indira.B, Orient Black Swan-2012.

3. A Manual for English Language Laboratories-D. Sudha Rani, Pearson.

I Year – I Semester	B. TECH – CSE-CS- VR22	L	T	P	C
Course Code : 1000221114	APPLIED PHYICS LAB	0	0	3	1.5

COURSE OUTCOMES:

	At the end of the course, the student will have the ability to:
CO1	Apply theoretical knowledge to understand the working principles of laboratory experiments related to optics.
CO2	Compute the required parameters using suitable formulas in lasers and fiber optics.
CO3	Adopt the experimental procedure to perform experiments on semiconducting materials.
CO4	Design and comprehend basic logic gates.

LIST OF EXPERIMENTS

S. No.	Name of the experiment	Skill
1	Newton's rings	Determination of radius of curvature of the lens
2	Interference by wedge shaped film using thin wire	Determination of thickness of a thin wire
3	Diffraction grating – Determination of wavelength of light	Determination of wavelength of light
4	Spectrometer – Determination of wavelength of monochromatic light	Normal incidence method
5	Laser beam divergence	Determination of laser beam divergence and spot size
6	Numerical aperture of optical fiber	Determination of numerical Aperture of optical fiber
7	Bending losses of Optical fibers	Determination of bending losses of optical fiber
8	Hall effect	Identification of semiconductor type and determination of Hall coefficient and carrier concentration
9	Thermistor characteristics	Determination of temperature coefficient of given thermistor

10	pn junction diode	Study of V-I characteristics of pn junction diode
11	Zener diode	Determination of breakdown voltage of Zener diode
12	Solar cell	Study of V-I characteristics of solar cell
13	Verification of Logic gates	Verification of Logic gates by sing Universal gates
14	Design of full adder	Design of Full adder by using Logic gates
15	Design of Half adder	Design of Half adder by using Logic gates
16	Design of Multiplexer and Demultiplexer	Design of Multiplexer and Demultiplexer
17	Design of encoder and decoder	Design of Multiplexer and Demultiplexer

Any relevant experiment may be added to the list and list of experiments will be updated time to time

Text Books:

1. C.L. Arora, Practical physics, S. Chand Publication

2. B.L. Worsnop and H. T. Flint, Advanced Practical Physics, Asia Publishing House

Reference Books:

1. P.K. Mittal, N. H. Ayachit, Engineering Physics: With Laboratory Manual, Wiley India.

I Year – I Semester	B. TECH – CSE-CS- VR22	L	T	P	C
Course Code : 1005221110	PROBLEM SOLVING AND PROGRAMMING USING C LAB	0	0	3	1.5

COURSE OBJECTIVES:
1. To understand computer programming and its roles in problem solving.
2. To understand and develop well-structured programs using C language.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:
CO1	Write compile and debug Programs in C language
CO2	Use operators, data types and write programs
CO3	Select the best loop construct for a given problem
CO4	Design and implement C programs

LIST OF EXPERIMENTS

S. No.	Name of the experiment	Skill
1	**Exercise – 1** a) Write an algorithm to find the sum and average of two numbers b) Write an algorithm to find Area, Diameter and Circumference of a Circle c) Draw a flowchart to find the largest of three numbers. d) Draw a flowchart to compute the final price of an item after figuring in sales tax.	Algorithms/ Flowchart
2	**Exercise – 2** a) Write a C program to compute perimeter and area of rectangle b) Write a C program to calculate distance between points c) Write a C Program to Simulate 3 Laws of Motion	Input/output
3.	**Exercise – 3** a) Write a C Program to convert Celsius to Fahrenheit and vice versa b) Write a C program to find maximum of three numbers using conditional operator.	Input/output
4.	**Exercise – 4** a) Write a C Program to find Whether the Given Year is a Leap Year or not. b) Write a C Program to find grade of student. c) Write a menu driven program to compute area of different geometrical shapes	Control Statements
5.	**Exercises –5**	Loops and Control

	a) Write a C Program to Find Whether the Given Number is i)Strong number ii)perfect number b) Write a C Program to print the following between 1 to n i) Prime Number ii) Armstrong Number	Statements

6.	**Exercises –6: Pattern Problems**
	Write a program to display the following pattern.
	
	1
	1 2
	1 2 3
	1 2 3 4
	1 2 3 4 5
	
	     *
	   * *
	  * * *
	 * * * *
	* * * * *
	
	     ●
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	  ****
	 *****
	******
	
	A
	A B
	A B C
	A B C D
	A B C D E
	A B C D E F
		Pattern problems

7.	**Exercises –7:** https://www.hackerrank.com/domains/algorithms?filters%5Bstatus%5D%5B%5D=unsolved&filters%5Bstatus%5D%5B%5D=solved&filters%5Bskills%5D%5B%5D=Problem%20Solving%20%28Basic%29&filters%5Bdifficulty%5D%5B%5D=easy&filters%5Bsubdomains%5D%5B%5D=warmup&badge_type=problem-solving Note: minimum of 5 problems to be solved	Introduction to online coding platform hacker rank
8.	**Exercise -8** Demonstration of arrays& Strings a) Write a C program to perform Linear Search b) Write a C program to perform transpose of two matrices c) Write a C program to perform multiplication of two matrices d) Implementation of string manipulation operations with and **without** library function.	Arrays and Strings

	i)copy ii) concatenate iii)length iv)compare	
9.	**Exercise -9** a) Write a C program to find cube of any number using function. b) Write a c program to find area and volume of geometric shapes using functions. c) Write a C program to check whether a number is even or odd using functions.	Functions
10.	**Exercise -10** a) Write a C Program illustrating Fibonacci, Factorial using recursion b) Write a C program to find power of any number using recursion. c) Write a C program to find GCD and LCM using recursion	Recursive Functions
11.	**Exercise -11** a) Write a C Program to Access Elements of an Array Using Pointer b) Write a C Program to find the sum of numbers with arrays and pointers. c) Write a C Program to illustrate parameter passing techniques	Pointers
12.	**Exercise -12** a) Write a C Program to Store Information of a student Using Structures b) Write a C program to create memory for int, char and float variable at run time.	Structures
13.	**Exercise -13** a) Write a program in C to copy a file in another name b) Write a C program to append multiple lines at the end of file	Files
14.	**Exercise -14** **https://www.hackerearth.com/practice/basic-programming/input-output/basics-of-input-output/practice-problems/2/?sort_by=solved&p_level=easy** **Note: Minimum of 5 problems to be solved**	Introduction to online coding platform hacker earth

Text Books:

1. Programming in C, Reema Thareja, and Oxford.
2. The C programming Language, Brain W. Kernighan, Dennis Ritchie,2e,pearson
3. C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage. Pub. Programming with C, Bichkar, Universities Press.

Reference Books:

1. ANSIC Programming gary J. Bronson. Cengage learning.
2. Let us 'C' by yashwant kanethkar, BPB Publications, 16th edition.

I Year – I Semester	B. TECH – CSE-CS- VR22	L	T	P	C
Course Code : 1000221170	ENGINEERING EXPLORATION LAB	0	0	2	1

Course Outcomes (COs):

At the end of the course the student is able to:

1. Explain the role of an Engineer as a problem solver.
2. Identify multi-disciplinary approach required in solving an engineering problem.
3. Build simple systems using engineering design process with mechanisms.
4. Understand the interface between hardware and Software Programming.
5. Demonstrate data acquisition and analysis skills using a tool.
6. Use basics of engineering project management skills in doing projects and by practicing ethical principle.

UNIT-1

Introduction to Engineering and Engineering Study

Introduction to Engineering and Engineering Study: Difference between science and engineering, scientist and engineer needs and wants various disciplines of engineering, some misconceptions of engineering, Graduate Attributes.

UNIT-2

Engineering Design :

Engineering Design Process, Multidisciplinary facet of design, Pair wise comparison chart, Introduction to mechatronics system, generation of multiple solution , Motor and battery sizing concepts, introduction to PCB design

UNIT-3

Mechanisms:

Basic Components of a Mechanism, Degrees of Freedom (Mobility of a Mechanism), 4 Bar Chain, Crank Rocker Mechanism, Slider Crank Mechanism. Simple Robotic Arm building.

UNIT-4

Platform based development:

Introduction to various platform based development (Ardiuno) programming and its essentials, Introduction to sensors, transducers and actuators and its interfacing with Ardiuno

UNIT-5

Data Acquisition and Analysis:

Types of Data, Descriptive Statistics techniques as applicable to different types of data, Types of graphs as applicable to different types of data, Usage of Microsoft Excel tool for descriptive statistics, Data Acquisition(Temperature and humidity) using Sensors interfaced with Ardiuno, Exporting acquired data to Microsoft Excel and analysis using visual representation.

UNIT-6

Project Management :

Introduction to Agile practices, Significance of team work, Importance of communication in engineering profession, Project management tools: Checklist, Timeline using Gantt Chart, Significance of documentation

Engineering Ethics :Identifying Engineering as a Profession, Significance of Professional Ethics, Code of Conduct for Engineers, Identifying Ethical Dilemmas in different tasks of engineering, Applying Moral Theories and codes of conduct for resolution of Ethical Dilemmas

I B. TECH - II SEMESTER SYLLABUS

I Year – II Semester	B. TECH – CSE-CS- VR22	L	T	P	C
Course Code : 1000221103	**LINEAR ALGEBRA AND TENSORS**	**3**	**1**	**0**	**3**

COURSE OBJECTIVES:
1. To instruct the concept of Matrices in solving system of linear algebraic equations
2. Course will illuminate the student in the standard concepts of Linear algebra.
3. Familiarize the methods to solving system of linear equations and compute Eigen values & Eigenvectors of a real matrix.
4. Important concepts of vector spaces such as independence, basis, dimensions, linear transformation and orthogonality.
5. To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

COURSE OUTCOMES:

COs	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	**Understand** the concept of the rank of the matrix and consistency to solve the system of Linear equations.	PO1 PO2	1 2
CO2	**Apply** direct methods to solve the system of Linear equations and understand the decomposition technique.	PO1 PO2	2 2
CO3	C**ompute** Eigen values and eigenvectors of a real matrix and study the nature of Quadratic form.	PO1 PO2	1 2
CO4	U**nderstand** the concept of the linear transform in vector space and make use of orthogonality in inner product.	PO1 PO2	1 2

UNIT- I

MATRICES AND SYSTEM OF LINEAR EQUATIONS   [14 Hours]

Row-reduced echelon matrices – Rank of matrix– Normal form – Constructing non-singular Matrices – Sparse matrices. Introduction to System of linear equations – representation in matrix form – consistency – solving homogeneous and non- homogeneous system of linear equations. Gauss elimination and Gauss-Jordan method

UNIT- II

MATRIX DECOMPOSITIONS: [10 Hours]

LU decomposition – Cholesky decomposition – Eigenvalues - Eigenvectors for symmetric, skew-symmetric and orthogonal Matrices – properties of eigenvalues and eigen vectors (without proofs) – Diagonalization -singular value decomposition.

UNIT- III

CAYLEY-HAMILTON THEOREM AND REAL QUADRATIC FORM: [8 Hours]

Cayley-Hamilton theorem – Inverse and power of matrix by using Cayley-Hamilton theorem – Real Quadratic form – Linear transformation of a Q.F.- Canonical form of a real Q.F – Reduction of Quadratic form to canonical form by using orthogonal reduction – Rank, index, signature and Nature of quadratic form.

UNIT- IV

VECTOR SPACES AND INNER PRODUCT SPACES [8 Hours]

Vector spaces – subspaces – Linear span – linear dependency — linear Transformations as Vectors and Matrices – Inner product spaces – Norm of vector – Orthogonal and Orthonormal sets – Gram-Schmidt Orthogonalization process.

UNIT- V
VECTORS AND TENSORS [8 Hours]
Scalar point function – vector point function – Vector differential operator – Gradient – directional derivative, angle between two surfaces- Divergence - Solenoidal vector - Curl - Irrotational Field - scalar potential.Tensor - Covariant and Contravariant Tensors.

Text Books:
1. Higher Engineering Mathematics by H.K. Dass, S. Chand Publications.
2. Higher Engineering Mathematics 2e, B. V. Ramana, Tata McGraw Hill Publishing Co. Ltd
3. Linear Algebra and Its Applications, 4e, Gilbert Strang, Cengage Learning.

Reference Books:
1. Higher Engineering Mathematics– 43rd Edition by Dr.B.S.Grewal, Khanna Publishers.
2. A Text book of Engineering Mathematics, N. P. Bali, Laxmi Publications (P) Ltd.
3. Advanced Engineering Mathematics, Erwin Kreszig, 8thEd, Wiley Student Edition.

I Year – II Semester	B. TECH – CSE-CS- VR22	L	T	P	C
Course Code : 1000221206	PROBABILITY AND STATISTICS	3	0	0	3

COURSE OBJECTIVES:

1. To explain fundamental concepts of probability theory and random variables.

2. To develop an understanding of the role of discrete and continuous probability distributions in science and engineering.

3. The basic ideas of statistical methods of studying data samples.

4. To impart statistical methods in various applications Engineering

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	**Explain** the notion of random variable and **evaluate** the expected value and probability of random variables.	PO1 PO2 PO12	1 2 3
CO2	**Apply** Binomial, Poisson, Normal, gamma and weibull distributions for real data to **compute** probabilities, theoretical frequencies.	PO1 PO2 PO3	2 2 3
CO3	**Evaluate** the confidence levels and maximum error for large and small samples, **Apply** the concept of hypothesis testing for large and small samples in real life situations to draw the inferences and estimate the goodness of fit.	PO1 PO2 PO3 PO4	1 2 3 3
CO4	**Examine** correlation for the bi-variate data and fit the different curves using principle of least squares and to **predict** the regression analysis.	PO1 PO2 PO3	1 2 3

UNIT- I

RANDOM VARIABLES: [8 Hours]

Probability- Conditional Probability- Bayes Theorem, Random experiment, sample space, events, Random variable, Discrete and Continuous variables, mathematical expectation and properties of Moment generating Functions(Without proof).

UNIT- II

DISTRIBUTIONS [10 Hours]

Binomial, Poisson distributions (MGF, Mean and Variance without proofs), Normal distribution (MGF, area and symmetric properties without proofs) -related properties, Gamma and Weibull distributions.

UNIT- III

SAMPLING DISTRIBUTIONS [10 Hours]

Introduction, Population and samples, Sampling distribution of mean for large and small samples (with known variance), proportion - Point and interval estimators for means and proportions (for large and small samples), Maximum error.

UNIT- IV

TESTING OF HYPOTHESIS [12 Hours]

Introduction, Null and alternative hypothesis, Type I and Type II errors, one tail, two-tail tests, Level of Significance. Tests concerning means, proportions and their differences using Z-test. Student's t-test, F-test and χ^2 test of goodness of fit and independence of attributes.

UNIT- V

CORRELATION & CURVE FITTING [8 Hours]

Introduction, simple correlation, regression, fitting of straight-line, second-degree curves, exponential and power curves by method of least squares.

TEXTBOOKS:

1. Probability & Statistics for Engineers, Miller& John E. Freund, Prentice Hall of India.
2. Probability& statistics for Engineers and Scientists; R.E.Walpole, S.L.Myeres Pearson

REFERENCE BOOKS:
1. Fundamentals of Applied Statisitics; S.C.Gupta&V.K.KapoorS.Chand& Sons, Cengage.

I Year – II Semester	B. TECH – CSE-CS- VR22	L	T	P	C
Course Code : 1005221201	**PROGRAMMING IN MODERN C++**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:
1. To understand how C++ improves C with object-oriented features
2. To learn the syntax and semantics of the C++ programming language.
3. To learn how containment and inheritance promote code reuse in C++.
4. To learn how inheritance and virtual functions implement dynamic binding with polymorphism.
5. To learn how to design and implement generic classes with C++ templates

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:
CO1	Articulate the principles of object-oriented programming and Outline the essential features and elements of the C++ programming language.
CO2	Apply the concepts of class, method, constructor, instance, data abstraction, function abstraction, inheritance, overriding, overloading, and polymorphism.
CO3	Apply virtual and pure virtual function in complex programming situations
CO4	To use template classes and the STL library in C++ and to incorporate exception handling in object oriented concepts

UNIT-1 : INTRODUCTION TO C++,CLASSES, OBJECTS , CONSTRUCTORS AND DESTRUCTOR

Difference between C and C++, Evolution of C++,The Object Oriented Technology, Disadvantage of Conventional Programming, Key Concepts of Object Oriented Programming, Advantages of OOP, Object Oriented Language, Classes in C++ - Declaring Objects- Access Specifiers and their Scope-Defining Member Function Overloading Member Function- Nested class. Introduction to Constructors and Destructor- Characteristics of a Constructor and Destructor-Types of Constructor - Anonymous Objects.

UNIT-2 : OPERATOR OVERLOADING AND TYPE CONVERSION & INHERITANCE

The Keyword Operator- Overloading Unary Operator- Operator Return Type- Rules for Overloading Operators, Overloading Assignment Operator (=). Inheritance, Types of Inheritance. Virtual Base class, object as class member, abstract classes.

UNIT-3 : POINTERS- BINDING POLYMORPHISMS AND VIRTUAL FUNCTIONS

Pointer, Features of Pointers- Pointer Declaration- Pointer to Class- Pointer Object- this Pointer- Pointer to Derived Classes and Base Class, Binding Polymorphisms and Virtual

Functions, Introduction- Binding in C++ - Virtual Functions- Rules for Virtual Function- Virtual Destructor.

UNIT-4 : GENERIC PROGRAMMING WITH TEMPLATES & EXCEPTION HANDLING

Generic Programming with Templates: Need for Templates - Definition of class Templates- Normal Function Templates-Introduction to the Standard Template Library: list-set-vector-map-deque-multimaps,-multisets.

UNIT-5: EXCEPTION HANDLING and C++ 11 GENERAL FEATURES

Introduction to Exception Handling: keywords try, throw and catch, multiple catch statements specifying exceptions, C++ 11: Genral Features, Rvalue and Move, How to optimize a C++ 11 program using Rvalue and move semantics, Rvalue and perfect forwarding, C++ class features, non-class type features, Lambda expression in C++,template features, Resource management by smart pointers, Concurrency in C++

Text Book:
1. C++ - The Complete Reference by Herbert Schildt, 4th edition, Tata McGraw Hill, 2015.

Reference Books:
1. C++ Program Design: An introduction to Programming and object – Oriented Design by Cohoon and Davidson, 3rd Edition, Tata McGraw Hill, 2003
2. Object-Oriented Programmig in C++ by Robert Lafore, 4th edition, Pearson Education. 3. Problem Solving with C++ by Walter Savitch, 9th edition, Pearson Education, 2015.

E-Books:
1.http://www.cplusplus.com/files/tutorial.pdf
2. http://mazonka.com/shared/Straustrup4th.pdf

E-RESOURCES:
1.https://www.coursera.org/learn/c-plus-plus-a#syllabus
2. https://www.udemy.com/free-learn-c-tutorial-beginners/

I Year – II Semester	**B. TECH – CSE-CS- VR22**	**L**	**T**	**P**	**C**
Course Code : 1005221202	**COMPUTER ORGANIZATION**	**3**	**0**	**0**	**3**

Course Objectives:
1. To study the basic organization and architecture of digital computers (CPU, memory, I/O, software). Also the Performance measurement of the computer system.
2. To understand various data transfer techniques in digital computer.
3. Be familiar with functional units of processor such as register file and arithmetic logic unit.
4. To understand the stages in instruction set life cycle.

Course Outcomes:

After completing this Course, the student should be able to:

COs	**Course Outcomes**
CO1	Apply the concepts of basic functional units to demonstrate the working of computational system.
CO2	Analyze the design issues in the development of processor and other components to articulate improvement in computer design.
CO3	Design Arithmetic Logic unit by analyzing performance issues
CO4	Compare various Memory organizations.

Unit-I: Introduction to Computers:

Basic of Computer, internal organization of CPU, Functional Units, Software, Basic Operational Concepts, Von Neumann Architecture, Data Representation, Fixed-Point Representation, Floating-Point Representation.

Synchronous Sequential Logic:

Introduction to Sequential Circuits, Storage Elements: Latches, Storage Elements: FlipFlops, Introduction to Registers and Counters.

Unit-II: Register Transfer and Micro operations:
Register Transfer Language, Bus and Memory Transfers, Arithmetic, Logic and Shift Micro operations, Arithmetic Logic Unit.
Basic Computer Organization: Instruction Codes, Computer Registers, Computer Instructions, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt.

Unit-III: Central Processing Unit:
Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes with numerical examples, Data Transfer and Manipulation, Program Control, Program Interrupt, Types of interrupts,

Hardwired & Micro Programmed (Control Unit), Control Memory, Address Sequencing, Conditional and Unconditional Branching, Micro program Example.

Unit-IV: Memory Organization:

Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

Unit-V: Input-Output Organization:
Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access.

Text Books:
1. Computer System Architecture, M.Moris Mano, 3rd Edition, Pearson/PHI
2. Computer Architecture and Organization, John P. Hayes, 3rd Edition, McGraw Hill.

Reference Books:
1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson
3. Fundamentals or Computer Organization and Design, - Siva Raama Dandamudi Springer Int. Edition.
4. "Computer Organization and Design: The Hardware/Software Interface" by David A. Patterson and John L. Hennessy

I Year – II Semester	B. TECH – CSE-CS- VR22	L	T	P	C
Course Code : 1005221203	WEB DESIGN	3	0	0	3

COURSE OBJECTIVES:
1. To understand web development and technologies.
2. Design static web application development and Students will gain the skills and front designs using CSS and Java Script.
3. Able to get project based experience needed for entry into web application and development careers.
4. To understand PHP language for server-side scripting

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:
CO1	Understand the web applications and HTML
CO2	Describe the basic concepts of HTML & CSS to design web pages and web site
CO3	Describe the basic concepts client side scripting importance.
CO4	Understand server-side scripting with PHP language

UNIT- I

INTRODUCTION
Introduction to HTML: History of HTML, What are HTML Tags and Attributes? Standard HTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Forms. GET and POST method.

UNIT- II

HTML5 and CSS:

New Elements in HTML5, New Markup Elements, New Media Elements, The Canvas Element, New Form Elements, New Input Type Attribute Values, Video on the Web, Video Formats.

Creating Style Sheet:

CSS Properties, Types of CSS, CSS Styling (Background, Text Format, Controlling Fonts),Levels of Style Sheets, Style Specification Formats, Selector Forms, The Box Model.

UNIT- III

Basics of XML:
Introduction to XML, Defining XML tags, Attributes and Values, Document Type Definition, XML Namespaces, XML Schema, Document object model, XML parsers - DOM and SAX Parsers in Java, XSLT, Example xml programs. Introduction to JSON objects.

UNIT- IV

Java Script:

Introduction to JavaScript, Applying JavaScript (internal and external), Understanding JS Syntax, Introduction to Document and Window Object, Variables and Operators, Data Types, Math and String Manipulation, Conditional Statements, Switch Case , Looping in java script, Function, Objects and Arrays.

UNIT- V

Introducing PHP:]
Introduction to client server working mechanism, creating PHP script, Running PHP script. Working with variables and constants, Data types, Operators. Conditional statements, Control statements, Arrays, working with functions.

Text Books:

1. Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.
2. Web Technologies, Uttam K Roy, Oxford
3. The Web Warrior Guide to Web Programming, Bai, Ekedahl, Farrelll, Gosselin, Zak, Karparhi, Maclntyre, Morrissey, Cengage

Reference Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
2. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning

I Year – II Semester	B. TECH – CSE-CS- VR22	L	T	P	C
Course Code : 1005221211	**PROGRAMMING IN C++ LAB**	**0**	**0**	**3**	**1.5**

COURSE OBJECTIVES:
1. To strengthen problem solving ability by using the characteristics of an object-oriented approach.
2. To design applications using object oriented features
3. To handle Exceptions in programs.
4. To teach the student to implement object oriented concepts

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:
CO1	Create simple programs using classes and objects in c++ and implement object oriented programs in c++
CO2	Implement object oriented programs using templates and exception handling mechanisms
CO3	Implement programs using STL

LIST OF EXPERIMENTS

S. No.	Name of the experiment	Skill
1.	**Learn C++ - Sololearn (Student should clear solo-learn certification)**	Certification
2.	**Exercise – 1 (Basics)** a) Write a Simple Program on printing "Hello World" and "Hello Name" where name is the input from the user b) Write a C++ program to find both the largest and smallest number in a list of integers c) Write a C++ program to find the sum of individual digits of a positive integer d) **https://www.hackerrank.com/domains/cpp/cpp-introduction/difficulty:easy/page:1**	Input/output/ Need to Complete Exercises on Hacker Rank
3.	**Exercise – 2** a) Write a program to implement call by value and call by reference using reference variable. b) Write a program to illustrate scope resolution, new and delete Operators.	Parameter passing techniques , Dynamic Memory Allocation
4.	**Exercise – 3** **a)** Write a program illustrating Inline Functions	Functions// Need to

	b) Write a program illustrates function overloading. Write 2 overloading functions for power. c) Write a program illustrates the use of default arguments for simple interest function. d) https://www.hackerrank.com/domains/cpp?filters%5Bsubdomains%5D%5B%5D=classes	Complete Exercises on Hacker Rank
5.	**Exercises –4** a) Write a program for illustrating Access Specifiers public, private, protected b) Write a program implementing Friend Function c) Write a program to illustrate this pointer d) https://www.hackerrank.com/domains/cpp?filters%5Bsubdomains%5D%5B%5D=cpp-strings	Access Specifiers// Need to Complete Exercises on Hacker Rank
6.	**Exercise -5** a) Write a program to Overload Unary, and Binary Operators as Member Function, and Non Member Function. b) Write a c ++ program to implement the overloading assignment = operator	Operator Overloading

7.	**Exercise -6**
	a) Write C++ Programs and incorporating various forms of Inheritance
	    i) Single Inheritance
	    ii) Hierarchical Inheritance
	    iii) Multiple Inheritances
	    iv) Multi-level inheritance
	    v) Hybrid inheritance
	b) Write a Program in C++ to illustrate the order of execution of constructors and destructors in inheritance
	C)https://www.hackerrank.com/domains/cpp?filters%5Bsubdomains%5D%5B%5D=inheritance
		Inheritance// Need to Complete Exercises on Hacker Rank

8.	**Exercise -7** a) Write a program to illustrate runtime polymorphism b) Write a program illustrates pure virtual function and calculate the area of different shapes by using abstract class.	Polymorphism
9.	**Exercise -8** a) Write a C++ Program to illustrate template class b) Write a Program to illustrate class templates with multiple parameters c) Write a Program to illustrate member function templates d) https://www.hackerrank.com/domains/cpp?filters%5Bsubdomains%5D%5B%5D=stl	Templates// Need to Complete Exercises on Hacker Rank
10.	**Exercise -9** a) Write a Program to implement List and List Operations. b) Write a Program to implement Vector and Vector Operations. c) Write a Program to implement Deque and Deque Operations. d) Write a Program to implement Map and Map Operations.	STL// Need to Complete Exercises on Hacker Rank

	e) Write a Program to implement set and set Operations. f) https://www.hackerrank.com/domains/cpp?filters%5Bsubdomains%5D%5B%5D=stl	
11.	**Exercise -10** a) Write a Program Containing a Possible Exception. Use a Try Block to Throw it and a Catch Block to Handle it Properly. b) Write a Program to Demonstrate the Catching of All Exceptions. c) https://www.hackerrank.com/domains/cpp?filters%5Bsubdomains%5D%5B%5D=stl d) https://www.hackerrank.com/domains/cpp?filters%5Bsubdomains%5D%5B%5D=other-concepts	Exception Handling// Need to Complete Exercises on Hacker Rank

Text Books:

1. The Complete Reference C++, Herbert Schildt, TMH.
2. Programming in C++, Ashok N Kamathane, Pearson 2nd Edition.

Reference Books:

1. Object Oriented Programming C++, Joyce Farrell, Cengage.
2. C++ Programming: from problem analysis to program design, DS Malik, Cengage Learing.
3. Computer programming with C++,kunal Pimparkhede,cambridge

I Year – II Semester	B. TECH – CSE-CS- VR22	L	T	P	C
Course Code : 1000221210	R PROGRAMMING LAB	0	0	3	1.5

COURSE OBJECTIVES:

1. To understand basics of R-programming
2. To understand importance of R-programming in data science

COURSE OUTCOMES:

COs	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Analyze statistical data using measures of central tendency, dispersion and location.	PO1 PO2 PO3	2 2 3
CO2	Recognize common probability distributions for discrete and continuous variables.	PO1 PO2	1 2
CO3	Apply discrete and continuous probability distributions to solve statistical problems	PO3 PO5	2 3
CO4	Apply the different sampling methods for designing and selecting a sample from a population	PO1 PO2 PO3 PO4 PO12	1 1 2 2 3

Expt. No.	Name of the Experiment
1.	INTRODUCTION TO R TOOL FOR DATA ANALYTICS SCIENCE Defining, Downloading and installing R
2	a) R as calculator using with and without R objects on console b) Using mathematical functions on console c) Getting and setting working directory to save files
3	a) Reading different types of data sets (.txt, .csv) from Web and disk and writing in file in specific disk location. b) Reading Excel data sheet in R c) Reading inbuilt data sets in R
4	a) Write an R script to find measures of central tendency and dispersion b) Write an R script to find measures of central tendency and dispersion for datasets c) Write an R script to find basic descriptive statistics using summary, str, quartile

		function.
5	a)	Write an R script to implement different data types
	b)	Write an R script to implement different data types
6	a)	Find the data distributions using box and scatter plot
	b)	Plot the histogram, bar chart and pie chart on sample data.
7	Write R script to simulate probability mass function of discrete random variables	
8	Write a R script to find the following probability distributions	
	1) Binomial 2) Poisson 3) Normal 4) uniform and 5) Exponential	

Web References:
1. http://www.r-bloggers.com
2. https://bookdown.org/speegled/foundations-of-statistics/#installing-r
3. https://rafalab.github.io/dsbook/getting-started.html

Reference Books:
1. 1.A Course in Statistics with R by Prabhanjan N. Tattar, Suresh Ramaiah, B. G. Manjunath
2. Maria Dolores Ugarte , Ana F. Militino , Alan T. Arnholt "Probability and Statistics withR" 2nd Edition on, CRC Press, 2016.
3. Yanchang Zhao, "R and Data Mining: Examples and Case Studies", Elsevier, 1st Edition, 2012.

I Year – II Semester	B. TECH – CSE-CS- VR22	L	T	P	C
Course Code : 1005221212	WEB DESIGN LAB	0	0	3	1.5

COURSE OBJECTIVES:
1. To understand computer programming and application software, package/ suites.
2. Design static web application development and Students will gain the skills and front designs.
3. Able to get project based experience needed for entry into web application and development careers.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:
CO1	Understand the usage and designing of web pages using HTML &CSS
CO2	Able to design the user interactive pages and web page layouts
CO3	Analyze a given problem and apply requisite appropriate tools for designing interactive web applications

LIST OF EXPERIMENTS

S. No.	Name of the experiment	Skill
1.	**Exercise – 1** Design Web page to illustrate the following • Title of web page • Heading styles • Various Text formatting tags	Web Page Design
2.	**Exercise – 2** Design Web page to illustrate the following • Apply font tag to the text • Upload and resize the image • Implement Image maps	Web Page Design
3.	**Exercise – 3** Design Web page to illustrate the following • Various List types • Display the class time table using table tag	Web Page Design
4.	**Exercise – 4** Design Web page to illustrate the following • Web page navigation (self and new page) • Implement image as web page navigation	Web Page Design

5.	**Exercise – 5**
	Implement the various CSS
	   • Inline CSS
	   • Internal CSS
	   • External CSS
		CSS

6.	**Exercise – 6** Design the Login and Registration forms and apply CSS	Web Page Design
7.	**Exercise – 7** Java script to implement decision control and loop statements	Web Page Design
8.	**Exercise – 8** Java script to implement functions concepts	Scripting
9.	**Exercise – 9** Login form validation using java script	Validation
10.	**Exercise – 10** Working with get and post method mechanism to interact server using PHP script	Web Page Design

Text Books:

1. Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.
2. Web Technologies, Uttam K Roy, Oxford
3. The Web Warrior Guide to Web Programming, Bai, Ekedahl, Farrelll, Gosselin, Zak, Karparhi, Maclntyre, Morrissey, Cengage

Reference Books:

1. Web Technologies, HTML< JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
2. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning

I Year – II Semester	B. TECH – CSE-CS- VR22	L	T	P	C
Course Code : 1000221121	CONSTITUTION OF INDIA	2	0	0	0

COURSE OBJECTIVES:
To provide basic information about Indian constitution. To identify individual role and ethical responsibility towards society. Introduction to the Constitution of India, The Making of the Constitution and Salient features of the Constitution. Preamble to the Indian Constitution Fundamental Rights & its limitations.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:
CO1	Understand the importance of constitution, fundamental rights and duties
CO2	Understand the structure of executive, legislature and judiciary
CO3	Understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
CO4	Understand the central and state relation financial and administrative.

UNIT- I
Introduction to Indian Constitution: Constitution' meaning of the term, Indian Constitution - constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties

UNIT- II
.Union Government and its Administration Structure of the Indian Union. President: Role, power and position, PM and Council of ministers, ,LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions;

UNIT- III
State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

UNIT- IV
A.Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role - CEO of Municipal Corporation PachayatiRaj: Functions ZilaPanchayat, CEO ZilaPanchayat

UNIT- IV

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:,

Text Books:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi
2. SubashKashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government andPolitics Hans
7. J. Raj IndianGovernment and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E Resources
1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details

www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
PROGRAM STRUCTURE – **VR-22**

II B. Tech. I Semester

S. No.	Course Code	Course Title	L	T	P	C
1	1000222104	Mathematical Foundations of Cyber Security	3	0	0	3
2	1005221204	Data Structures	3	0	0	3
3	1005222100	Java Programming	3	0	0	3
4	1005222101	Operating Systems	3	0	0	3
5	1005222102	Software Engineering	3	1	0	3
6	1005221213	Data Structures Lab	0	0	3	1.5
7	1005222110	Java programming Lab	0	0	3	1.5
8	1005222111	Operating Systems Lab	0	0	3	1.5
9	1005222180	Skill advanced Course / soft skill course	0	0	4	2
10	1000222120	Environmental Science	2	0	0	0
Total Credits						**21.5**

II B. Tech. II Semester

S. No.	Course Code	Course Title	L	T	P	C
1	1000222100	Discrete Mathematical Structures	3	0	0	3
2	1005222103	Programming Essentials in python	3	0	0	3
3	1005222200	Database Management Systems	3	0	0	3
4	1046222200	Applied Cryptography	3	0	0	3
5		**OPEN ELECTIVE-I:** 1. Microprocessor 2. Industrial waste and waste water management 3.Environmental pollution 4. Renewable Energy Sources	3	0	0	3
6	1005222210	Database Management Systems Lab	0	0	3	1.5
7	1005222113	Programming Essentials in python Lab	0	0	3	1.5
8	1005222280	Skill advanced Course / soft skill course	0	0	4	2
9	1005222270	Mini Project (EPICS)	0	0	2	1
10	1000222121	Life Skills	2	0	0	0
Total Credits						**21**
MANDATORY SUMMER INTERNSHP						

Total Credits (II Year - I & II SEM) = 21.5+21= 42.5

II B. TECH - I SEMESTER SYLLABUS

II Year – I Semester	B. Tech. (CSE-CS) – VR22	L	T	P	C
Course Code : 1000222104	Mathematical Foundations of Cyber Security	3	0	0	3

Course Objectives

1. It highlights the basics of number theory like, GCD, Divisibility, prime numbers, their applications, modular arithmetic etc.
2. To explain algebraic structure for Groups, finite fields, Elliptic curve crypto systems and discrete logarithms.
3. To discuss all mathematical concepts those are important for cryptographic applications.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Mapping with PO's
1	Analyze modular arithmetic and integer arithmetic operations using Euclidean algorithm	Analyze	1,2
2	Analyze linear congruent equations using residue matrices and the finite fields of type GF(2n) for modern block ciphers.	Analyze	1,2
3	Apply prime number logic on factorization algorithms in cryptography.	Apply	1,2,3
4	Apply Chinese remainder theorem and quadratic congruence on cryptography for calculating co-primes.	Apply	1,2,3
5	Apply Elliptic curve crypto systems over Real Numbers	Apply	1,2,3

UNIT – I

INTEGER ARITHMETIC   **[10 Hours]**

Set of Integers-Binary Operations- Integer Division – Divisibility - Linear Diophantine Equations; Modular arithmetic - Modulo Operator - Set of Residues: Zn - Congruence - Operations in Z – Inverses - Addition and Multiplication Tables - Different Sets for Addition and Multiplication - Two More Sets; Matrices - Definitions - Operations and Relations - Determinant – Inverses - Residue Matrices.

UNIT II

LINEAR CONGRUENCE   [10Hours]

Single-Variable Linear Equations - Set of Linear Equations; algebraic structures - Groups - Ring – Field;GF (2n) fields - Polynomials - Using a Generator; Primes - Definition - Cardinality of Primes - Checking for Primness - Euler's Phi-Function - Fermat's Little Theorem - Euler's Theorem - Generating Primes; primality testing - Deterministic Algorithms - Probabilistic Algorithms - Recommended Primality Test - factorization - Fundamental Theorem of Arithmetic - Factorization Methods - Fermat Method - Pollard p – 1 Method - Pollard Rho Method.

UNIT III

QUADRATIC CONGRUENCE[10 Hours]

Chinese remainder theorem- Applications; Quadratic congruence - Quadratic Congruence Modulo a Prime - Quadratic Congruence Modulo a Composite; Exponentiation and Logarithm - Exponentiation – Logarithms

UNIT IV

CRYPTOGRAPHY [8Hours]

Elliptic Curve Cryptosystems - Elliptic Curves over Real Numbers - Elliptic Curves over GF(p) - Elliptic Curves over GF (2n);

UNIT V

CYCLIC AND PERMUTATION GROUPS[10 Hours]

Normal sub-group (review concepts), isomorphism and homomorphism, cyclic And permutation groups.

Text Books:

1. A. ForouzanBehrouz, "Cryptography and Network Security" TMH Publication ,3rd Edition,2012
2. D.M. Burton," Elementary Number Theory", McGraw Hill 7th Edition,2017

Reference Books:

1. Sheldon M Ross, "Introduction to Probability Models", Academic Press, 2003.
2. William Stallings," Cryptography and Network Security", 5th Edition Pearson Education
3. Ivan Niven, Herbert S. Zuckerman, and Hugh L. Montgomery,"An introduction to the theory of numbers",John Wiley and Sons 2004.
4. C.L. Liu, "Elements of Discrete mathematics",McGraw Hill, 2008.

II Year – I Semester	B. Tech. (CSE-CS) – VR22	L	T	P	C
Course Code : 1005221204	Data Structures	3	0	0	3

COURSE OBJECTIVES:
1. Basics of data structures including their fundamentals building blocks: arrays and linked list.
2. To solve problems using linear data structures such as linear lists, stacks, queues.
3. To solve problems using searching and sorting techniques.
4. To be familiar with non-linear data structures such as trees.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:
CO1	Apply the C language Concepts: Pointers, Structures, Unions and recursion to solve the problems
CO2	Implement Standard Data Structures like Stack, Queue, List, Trees and Graphs
CO3	Choose appropriate data structure while building new application
CO4	Explain the need for data structuring techniques

UNIT- I

ARRAYS AND LINKED LISTS
The Abstract Data Type (ADT), Dynamic allocation of Arrays, Representation of multidimensional Arrays.
Single Linked List, Polynomials, Polynomial Representation- Adding Polynomials- Circular List Representation of Polynomials, Sparse Matrices, Sparse Matrix Representation, Doubly Linked Lists. **[8 Hours]**

UNIT-II

STACKS AND QUEUES
The Stack, Stacks using Dynamic Arrays, Recursion, Linked Stacks, The Queue, Linked Queues, Circular Queues using Dynamic Arrays, De-queue. Application of stacks and queues, Evaluation of Expressions, Expression- Postfix Notation- Infix to Postfix, Towers Of Hanoi Problem. **[8 Hours]**

UNIT-III

SEARCHING AND SORTING
Searching: Linear Search, Binary Search.
Sorting: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort   **[8 Hours]**

UNIT-IV

TREES:
Introduction, Terminology, Representation of Trees, Binary Trees, The Abstract Data Type, Properties of Binary Tress, Binary Tree Representations, Binary Tree Traversals: Inorder Traversal, Preorder Traversal, Postorder Traversal, Binary Search Trees: Definition, Searching a Binary Search Tree, Insertion into a Binary Search Tree, Deletion from a Binary Search Tree .   **[10 Hours]**

UNIT-V

GRAPHS:
The Graph Abstract Data Type, Introduction, Definition, Graph Representation, Elementary Graph Operation- Depth First Search, Breadth First Search, Connected Components, Spanning Trees, Biconnected Components, Minimum Cost Spanning Trees- Kruskal's Algorithm, Prim s Algorithm, Shortest Paths and Transitive Closure, Single Source/All Destination, All-Pairs Shortest Path.   **[10 Hours]**

Text Books:

1.   Fundamentals of Data Structures in C, Ellis Horowtiz, S.Sahni, Andrews Freed, University Press (India). Second Edition.
2.   Data Structures and Algorithm Analysis in C, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.

Reference Books:

1.   Classic Data Structures, Debasis Samantha, PHI. (Second Edition)
2.   Data Structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
3.   Data Structures using C, Reema Thareja, Oxford Home Publications, Second Edition

E-Books:

1.   https://www.cs.bham.ac.uk/~jxb/DSA/dsa.pdf
2.   https://vardhaman.org/wp-content/uploads/2018/12/Data%20Structures.pdf
3.   https://www.ncertbooks.guru/data-structures/

NPTEL/MOOC:

https://nptel.ac.in/courses/106/102/106102064/

II Year – I Semester	B. Tech. (CSE-CS) – VR22	L	T	P	C
Course Code : 1005222100	**Java Programming**	3	0	0	3

COURSE OBJECTIVES:

1. Implementing program for user interface and application development using core java principles.
2. Comprehension of java programming constructs, control structures in java.
3. Implementing object-oriented constructs such as various class hierarchies, interfaces and exception handling.
4. Understanding of thread concepts and I/O in java.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:
CO1	Use the Java programming language for various programming technologies.
CO2	Develop software in the Java programming language.
CO3	Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements.
CO4	Propose the use of certain technologies by implementing them in the Java programming language to solve the given problem.

UNIT- I

INTRODUCTION TO OOPS

Introduction to object-oriented programming -principles of object-oriented languages - procedural languages Vs. OOPs -applications of OOPs -java features - JVM -program structures -Variables -primitive data types –identifiers -naming conventions –keywords – literals –operators –binary -unary and ternary –expression -precedence rules and associativity -primitive type conversion and casting, flow of control. **[6 Hours]**

UNIT-II

PROGRAMMING CONSTRUCTS

Arrays-one dimensional and multidimensional -command line arguments. Introducing classes –class fundamentals –methods -objects -constructors –this keyword –-garbage collection- Nested Classes – Polymorphism. **[8 Hours]**

UNIT-III

INHERITANCE, INTERFACE AND EXCEPTIONS
Types of inheritance-Super and Final -Interface-Abstract Classes- Interface vs Abstract classes -Packages-Creating Packages -access protection - Exception handling, importance of try, catch, throw, throws and finally block, user defined exceptions, Assertions.   [**8 Hours**]

UNIT-IV

MULTITHREADING AND I/O
Threads -Thread Life Cycle-Thread priority –multithreading –Synchronization -suspending and resuming threads -communication between threads. Java I/O streaming –filter and pipe streams.   [**8 Hours**]

UNIT-V

COLLECTION FRAMEWORKS
Collection Framework in Java –Introduction to Java Collections, Overview of Java Collection frame work, Generics, commonly used Collection classes–Array List, Vector, Hash table, Stack, Enumeration, Iterator, String Tokenizer, Random, Scanner, calendar and Properties.   [**10 Hours**]

Text Books:

1. The complete Reference Java, 8th edition, Herbert Schildt, TMH.
2. Programming in JAVA, Sachin Malhotra, SaurabhChoudary, Oxford.
3. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson.

Reference Books:

1. Head First Java, Author – Kathy Sierra & Bert Bates,Latest Edition – 2nd Edition,Publisher – Shroff/O'Reilly
2. Effective Java, Author – Joshua Bloch,Latest Edition – 3rd Edition,Publisher – Addison Wesley
3. Core Java: An Integrated Approach, New: Includes All Versions upto Java 8 Paperback – 1 January 2016by R. Nageswara Rao

E-Books:

 https://docs.oracle.com/en/java/

NPTEL/MOOC:

https://nptel.ac.in/courses/106/105/106105191/

https://onlinecourses.nptel.ac.in/noc20_cs85/preview

II Year – I Semester	B. Tech. (CSE-CS) – VR22	L	T	P	C
Course Code : 1005222101	**Operating Systems**	3	0	0	3

COURSE OBJECTIVES:
1. Study the basic concepts and functions of operating systems.
2. Understand the structure and functions of OS.
3. Learn about Processes, Threads and Scheduling algorithms.
4. Understand the principles of concurrency and Deadlocks.
5. Learn various memory management schemes.
6. Study I/O management and File systems.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:
CO1	Summarize various concepts of Operating Systems
CO2	Implement and Apply Process Scheduling Algorithms
CO3	Illustrate concepts of Paging, Segmentation and Apply Concurrency, Deadlock Mechanisms in real world
CO4	Analyze the concepts of file systems in operating systems

UNIT- I

INTRODUCTION TO OPERATING SYSTEM CONCEPT
Types of operating systems, operating systems concepts, operating systems services, Introduction to System call, System call types. **[8 Hours]**

UNIT-II

PROCESS MANAGEMENT
Process concept, The process, Process State Diagram ,Process control block, Process Scheduling- Scheduling Queues, Schedulers, Operations on Processes, Inter process Communication, Threading Issues, Scheduling-Basic Concepts, Scheduling Criteria, Scheduling Algorithms. **[8 Hours]**

UNIT-III

MEMORY MANAGEMENT
Swapping, Contiguous Memory Allocation, Paging, structure of the Page Table, Segmentation.

VIRTUAL MEMORY MANAGEMENT
Virtual Memory, Demand Paging, Page-Replacement Algorithms, Thrashing **[10 Hours]**

UNIT-IV

CONCURRENCY
Process Synchronization, The Critical- Section Problem, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization Examples.
[8 Hours]

UNIT-V

FILE SYSTEM INTERFACE
The concept of a file, Access Methods, Directory structure, File system mounting, files sharing, protection. File System implementation- File system structure, allocation methods, free-space management Mass-storage structure overview of Mass-storage structure, Disk scheduling, Device drivers. Introduction to Dockers. **[10 Hours]**

Text Books:

1. Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne 9th Edition, John Wiley and Sons Inc., 2012.
2. Operating Systems – Internals and Design Principles, William Stallings, 7th Edition, Prentice Hall, 2011.
3. Operating Systems-S Halder, Alex A Aravind Pearson Education Second 2016.

Reference Books:

1. Modern Operating Systems, Andrew S. Tanenbaum, Second Edition, Addison Wesley, 2001.
2. Operating Systems: A Design-Oriented Approach, Charles Crowley, Tata Mc Graw Hill Education", 1996.
3. Operating Systems: A Concept-Based Approach, D M Dhamdhere, Second Edition, TataMc Graw-Hill Education, 2007.

II Year – I Semester	B. Tech. (CSE-CS) – VR22	L	T	P	C
Course Code : 1005222102	**Software Engineering**	3	0	0	3

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:
CO1	Apply the appropriate process models for the application development of SDLC
CO2	Understand the phases of SDLC from requirement gathering phase to design phase via Analysis Phase
CO3	Analyzing the strategies for coding and testing phase in Software product development
CO4	Apply the knowledge about estimation and maintenance of software systems and modeling the software project by using CASE tools

UNIT- I

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

Process Models: Generic Process Models like Waterfall Models, Evolutionary Process Model, V-Model, Agile Model etc. Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Terminology, Product and Process. **[10 Hours]**

UNIT-II

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

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

[8 Hours]

UNIT-III

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

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

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

[10 Hours]

UNIT-IV

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

Computer Aided Software Engineering: Case and its Scope, Case Environment, Case Support in Software Life Cycle, Other Characteristics of Case Tools, Towards Second Generation CASE Tool, Architecture of a Case Environment

[9 Hours]

UNIT-V

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

Software Reuse: what can be reused? Why almost No Reuse So Far? Basic Issues in Reuse Approach, Reuse at Organization Level.

[8 Hours]

Text Books:

1. Software engineering A practitioner's Approach, Roger S. Pressman, Seventh Edition Mc GrawHill International Edition.
2. Fundamentals of Software Engineering, Rajib Mall, Third Edition, PHI.
3. Software Engineering, Ian Sommerville, Ninth edition, Pearson education

Reference Books:

1. Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008
2. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
3. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.

II Year – I Semester	B. Tech. (CSE-CS) – VR22	L	T	P	C
Course Code: 1005221213	**Data Structures Lab**	0	0	3	1.5

COURSE OBJECTIVES:
1. To develop skills to design and analyze simple linear and non-linear data structures
2. To Strengthen the ability to identify and apply the suitable data structure for the given real-world problem
3. To gain knowledge in practical applications of data structures

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:
CO1	Implement the programs on arrays and linked lists
CO2	Implement Standard Data Structures like Stacks and Queue
CO3	Analyze the time and space efficiency of the data structure be capable to identity the appropriate data structure for given problem
CO4	Have practical knowledge on the application of data structures

LIST OF EXPERIMENTS

S. No.	Name of the experiment	Skill
1.	**Exercise – 1** a)Write a program to implement dynamic arrays b) Write a program to implement sparse matrices using arrays	Arrays
2	**Exercise – 2** Write a program to implement a Single Linked List and its operations.	Single Linked List
3.	**Exercise – 3** Write a program to implement a Doubly Linked List and its operations.	Doubly Linked List
4.	**Exercise – 4** Write a program to implement a circular Linked List and its operations	Circular Linked List
5.	**Exercise – 5** Write a program to implement the following using arrays and linked list a) Stack b) Queue	Linear Data Structures

6.	**Exercise – 6** Write a program to do the following a) Infix to postfix conversion. b) Evaluation of postfix expression.	Applications of Stack
7.	**Exercise – 7** Write a program to implement: a)Linear Search b)Binary Search	Searching Strategies
8.	**Exercise – 8** Develop a Program to find number of comparisons and swapping for a given list of numbers a) Bubble Sort b) Selection Sort c)Insertion sort	In-Place Sorting techniques
9.	**Exercise – 9** Write a program for the following a) Merge Sort b) Quick Sort	Divide and Conquer
10.	**Exercise – 10** a) Write a program that use non-recursive functions to traverse the given binary tree in i. Pre-order ii. In-order iii. Post-order. b) Implementation of Binary Search trees.	Trees
11.	**Exercise – 11** Write a program for the following modules a) To implement Prim's algorithm to generate a min-cost spanning tree. b) To implement Kruskal's algorithm to generate a min-cost spanning tree. c) To implement Dijkstra's algorithm to find shortest path in the graph.	Graphs
12.	**Exercise – 12** a) Implement Depth First Search **b) Implement Breadth First Search**	Graphs

Text Books:

1. Fundamentals of Data structures in C, S. Sahni, University Press (India) Pvt. Ltd, 2nd edition, Universities Press, Pvt. Ltd.
2. Data structures and Algorithm Analysis in C, Mark Allen Weiss, Pearson Education. Ltd., Second Edition

Reference Books:

1. Classic Data Structures, Debasis Samantha, PHI. (Second Edition)
2. Data Structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
3. Data Structures using C, Reema Thareja, Oxford Home Publications, Second Edition.

II Year – I Semester	B. Tech (CSE-CS) – VR22	L	T	P	C
Course Code : 1005222110	Java Programming Lab	0	0	3	1.5

COURSE OBJECTIVES:

1. Implementing program for user interface and application development using core java principles.
2. Comprehension of java programming constructs, control structures in java.
3. Implementing object-oriented constructs such as various class hierarchies, interfaces and exception handling.
4. Understanding of thread concepts and I/O in java
5. To understand computer programming and application software, package/ suites.

CO's	At the end of the course, the student will have the ability to:
CO1	Use the Java programming language for various programming technologies.
CO2	Develop software in the Java programming language.
CO3	Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements.
CO4	Propose the use of certain technologies by implementing them in the Java programming language to solve the given problem.

LIST OF EXPERIMENTS

S. No.	Name of the experiment	Skill
1.	**Exercise – 1 (Basics)** a) Write a JAVA program to display default value of all primitive data type of JAVA b) Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root. c) Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers. d) Write a case study on public static void main (250 words)	Basic Programming

2.	**Exercise – 2** a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism. b) Write a JAVA program to sort for an element in a given list of elements using bubble sort. c) Write a JAVA program to sort for an element in a given list of elements using merge sort. d) Write a JAVA program using String Buffer to delete, remove character.	Sorting
3.	**Exercise – 3** a) Write a JAVA program to implement class mechanism. – Create a class, methods and invoke them inside main method. b) Write a JAVA program to implement constructor	Constructor
4.	**Exercises –4** a) Write a JAVA program to implement constructor overloading. b) Write a JAVA program implements method overloading.	Constructor Overloading
5.	**Exercise -5** a) Write a JAVA program to implement Single Inheritance b) Write a JAVA program to implement multi-level Inheritance c) Write a java program for abstract class to find areas of different shapes	Inheritance
6.	**Exercise -6** a) Write a JAVA program give example for "super" keyword. b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?	Programming using "super" Keyword
7.	**Exercise -7** a) Write a JAVA program that describes exception handling mechanism b) Write a JAVA program Illustrating Multiple catch clauses	Exception Handling
8.	**Exercise -8** a) Write a JAVA program that implements Runtime polymorphism b) Write a Case study on run time polymorphism, inheritance that implements in above problem	Runtime Polymorphism
9.	**Exercise -9** a) Write a JAVA program for creation of Illustrating throw b) Write a JAVA program for creation of Illustrating finally c) Write a JAVA program for creation of Java Built-in Exceptions	Exceptions

	d) Write a JAVA program for creation of User Defined Exception. e) Write a Program to implement set and set Operations.	
10.	**Exercise -10** a) Write a JAVA program that creates threads by extending Thread class. First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds, (Repeat the same by implementing Runnable) b) Write a program illustrating is Alive and join c) Write a Program illustrating Daemon Threads.	Threads
11.	**Exercise -11** a) Write a JAVA program for Producer Consumer Problem b) Write a case study on thread Synchronization after solving the above producer consumer problem	Synchronization
12.	**Exercise -12** a) Write a JAVA program illustrates class path b) Write a case study on including in class path in your os environment of your package. c) Write a JAVA program that import and use the defined your package in the previous Problem	Package
13.	**Exercise -13** a) What is the difference between List and Set? Implement a Program to show the differences. b) What is the difference between HashSet and TreeSet? Implement a Program to show the differences. c) What is the difference between Set and Map? Implement a Program to show the differences.	Set and Map

Text Books:

1. The complete Reference Java, 8th edition, Herbert Schildt, TMH.
2. Programming in JAVA, Sachin Malhotra, SaurabhChoudary, Oxford.
3. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson.

Reference Books:

1. Head First Java, Author – Kathy Sierra & Bert Bates,Latest Edition – 2nd Edition,Publisher – Shroff/O'Reilly
2. Effective Java,Author – Joshua Bloch,Latest Edition – 3rd Edition,Publisher – Addison Wesley
3. Core Java: An Integrated Approach, New: Includes All Versions upto Java 8 Paperback – 1 January 2016by R. Nageswara Rao

II Year – I Semester	B. Tech (CSE-CS) – VR22	L	T	P	C
Course Code : 1005222111	Operating Systems Lab	0	0	3	1.5

COURSE OBJECTIVES:
1. To provide an understanding of the design aspects of operating system.
2. To provide practical knowledge on the different concepts of operating systems.
3. To familiarize students with the Linux environment.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:
CO1	Stimulate CPU scheduling algorithms in operating system.
CO2	Evaluate memory management techniques in operating system.
CO3	Implement page replacement algorithms in operating system
CO4	Implement file allocation strategies used in operating system.

LIST OF EXPERIMENTS

S. No.	Name of the experiment	Skill
1.	**Exercise -1** Study of Unix/Linux general purpose utility command list man,who,cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown.	Unix/Linux Commands
2.	**Exercise – 2** Simulate the following CPU scheduling algorithms a) Round Robin b) SJF c) FCFS d) Priority	CPU Scheduling
3.	**Exercise – 3** Simulate MVT and MFT	Multi Programming
4.	**Exercise – 4** Simulate Bankers Algorithm for Dead Lock Avoidance	Dead Lock Avoidance
5.	**Exercises –5** Simulate Bankers Algorithm for Dead Lock Prevention	Dead Lock Prevention
6.	**Exercise -6** Simulate all page replacement algorithms. a) FIFO b) LRU c) LFU	Page Replacement
7.	**Exercise -7** Simulate all File allocation strategies a) Sequenced b) Indexed c) Linked	File Allocation

8.	**Exercise -8** C program to emulate the UNIX ls –l command.	ls –l command
9.	**Exercise -9** C program that illustrates how to execute two commands concurrently with a command pipe.	Command Pipe
10.	**Exercise -10** C program that illustrates two processes communicating using shared memory	Shared Memory

Text Books:
1. Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne9th Edition, John Wiley and Sons Inc., 2012.
2. Operating Systems – Internals and Design Principles, William Stallings, 7th Edition, Prentice Hall, 2011.
3. Operating Systems-S Halder, Alex A Aravind Pearson Education Second 2016.

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2. Operating Systems: A Design-Oriented Approach, Charles Crowley, Tata Mc Graw Hill Education", 1996.
3. Operating Systems: A Concept-Based Approach, D M Dhamdhere, Second Edition, TataMc Graw-Hill Education, 2007.

II Year – I Semester	B. Tech (CSE-CS) – VR22	L	T	P	C
Course Code : 1005222180	Employability Readiness Program (Skill Oriented Course)	1	0	2	2

COURSE OBJECTIVES

1. To enhance the problem solving skills in the area of 'Quantitative Aptitude' this will enable the students to achieve in-campus placements and competitive examinations.
2. To improve the logical thinking capability of students by enhancing the skills in Reasoning.
3. To encourage the all-round development of students by focusing on verbal ability.
4. To perform better during Campus Recruitment and various interviews they face in their career.

COURSE OUTCOMES

CO	At the end of the course, the student will have the ability to:	Strength of Mapping	POs Mapped
CO1	Follow strategies in minimizing time consumption in problem solving and apply shortcut methods to solve problems and confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life.	Understanding and Applying (L2&L3)	PO-1 PO-2 PO-12
CO2	Apply various methods of solving a problem by analysing the concept and situation effectively.	Understanding and Applying (L2&L3)	PO-1 PO-2 PO-12
CO3	Communicate effectively with improved vocabulary and able to write e-mails, essays and resumes appropriately.	Understanding (L2)	PO-10 PO-12
CO4	Succeed in professional and personal life by applying all mathematical, reasoning and verbal skills.	Understanding and Applying (L2&L3)	PO-1 PO-2 PO-10 PO-12

Part-A   **No. of lecture hours: 25**

Aptitude

Number System: Speed Maths, Numbers, Factors, Prime & Co-Primes, LCM, HCF, Divisibility rules, finding unit place digit and last two digits of an expression.

Averages and Ages: Average of different groups, change in averages by adding, deleting and replacement of objects, problems on ages.

Ratio, Proportion and Variations: Definition of Ratio, Ratio of Proportion, Comparison of ratios, Compound ratio, Direct and indirect proportion.

Allegation and mixtures: Allegation rule, Mean value of the mixture, Replacement of equal amount of quantity.

Percentages: Converting fractions and decimal into percentages, successive percentage, populations, expenditure and savings

Time and Work: Men and Days, Work and Wages, Hours and Work, Alternate days concept.

Time and Distance: Difference between the average and relative speeds, reaching the destination late and early, Stoppage time per hour, time and distance between two moving bodies.

Trains, Boats and Streams: Train crossing man, same and opposite directions, Speed of boat and stream.

Profit and loss: Relation between Cost price and Selling price, Discount and Marked price, Gain or Loss percentages on selling price

Simple and Compound Interest: Problems on Interest (I), Amount (A), Principal (P) and Rate of

Interest(R), Difference between the simple interest and compound interest for 2 and 3 years.

Permutation and Combination: Fundamental rules, problems on permutations & combinations.

Logical Reasoning

Blood Relations: Defining the various relations among the members of a family, Solving Blood Relation Puzzles by using symbols and notations. Problems on Coded relations.

Series completion: Number series, Alphabet series, and Letter series.

Coding and Decoding: Letter coding, Number coding, Number to letter coding, Matrix coding, Substitution, Mixed letter coding, Mixed number coding, deciphering individual letter codes by analysis.

Direction sense test: Sort of directions in puzzles distance between two points, problems on shadows, Application of triangular triplets.

Clocks: Relation between minute-hour hands, angle vs. time, exceptional cases in clocks

Calendars: Definition of a Leap Year, Finding the odd days, finding the day of any random calendar date, repetition of calendar years.

Part-B	**No. of lecture hours: 25**

Verbal: Competitive Grammar: Verb-Tenses, Adjectives & Adverb, Preposition, Conjunction, Syntax (Activity based learning).

Word Etymology, One word substitutes, Word games – Vocabulary development.

Reading Comprehension: General Strategies for Reading Comprehension: Narrative Text, Strategies for Reading Comprehension: Expository Text, Main Idea/Summarization

Sentence Correction/ Improvement/ Completion, Subject-verb agreement, Repetition, Error in modifiers.

Direct-Indirect Speech, Active Passive Voice, Cloze Test

Text Books:

1. Quantitative Aptitude by R S Agarwal, S Chand Publications

2. Quantitative Analysis. Third edition (Hall, William Thomas). Norris F. Hall · Cite this: J. Chem. Educ. 1942, 19, 7, 350.

3. A Modern Approach to Verbal Reasoning by R S Agarwal, S.Chand Publications.

4. Arun Sharma and Meenakshi Upadhyay for verbal ability

Reference Books:

1. Quantitative Aptitude – Abhijit Guha, McGraw Hills.

2. Logical Reasoning, Arun Sharma, McGraw Hill.

3. Analytical & Logical Reasoning, Peeyush Bhardwaj, Arihant Publications

4. Mc Graw Hill Objective English 5 th edition.

II Year – I Semester	B. Tech (CSE-CS) – VR22	L	T	P	C
Course Code : 1000222120	**Environmental Science**	2	0	0	0

COURSE OBJECTIVES:

The aim of **Environmental studies**) is to develop a world population that is aware of and concerned about the **environment** and its associated problems and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively towards solutions to current problems and prevention of new ones.

1. Classify, describes, and explain the concept of Ecosystems and Environmental Engineering
2. Overall understanding of different types of natural resources and their conservation
3. Acquaintance on various environmental challenges induced due to unplanned anthropocentric activities
4. An understanding of the environmental impact of developmental activities and the importance of environmental management and awareness of the social issues, environmental legislation, and global treats

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century	PO 7 and 12	1
CO2	Recognize the interconnection of human dependence on the earth's ecosystems and Influence their society in proper utilization of goods and services.	PO 6, 7, 8, 9 and 12	1
CO3	Gain a higher level of personal involvement and interest in understanding and solving environmental resource problems and their conservation practices. And Overall understanding of different types of natural resources and their conservation	PO 2, 6, 7, 8, 9 and 12	2
CO4	Learn the management of environmental hazards and mitigate disasters and have a clear understanding of environmental concerns and follow sustainable development practices.	PO 6, 7, 9 and 12	2

UNIT- I

[8 Hours]

Multidisciplinary Nature of Environmental Studies: Definition Scope and its importance, Multidisciplinary nature of Environmental science.

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Energy flow in the ecosystem – Ecological pyramids. Ecological Succession.

Social Issues and Environment: Impact of microbial toxins on human health. Water conservation, rainwater harvesting, and watershed management – Resettlement and

rehabilitation of people; its problems and concerns. Case Studies.Global Environmental Issues - Climate change, Global warming, Acid rain, Ozone layer depletion.

UNIT- II

[4 Hours]

Biodiversity and its Conservation: Definition: genetic, species, and ecosystem diversity – Value of biodiversity, Hot-spots of biodiversity, threats to biodiversity, Endangered and endemic species of India – Conservation of biodiversity.

UNIT- III

[5 Hours]

Environmental Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over-exploitation, deforestation, Timber extraction, Mining, dams, and other effects on forest – Water resources – Use and over utilization of surface and groundwater – Floods, drought, dams – benefits and problems – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, case studies – Energy resources.

UNIT- IV

[9 Hours]

ENVIRONMENTAL POLLUTION: Definition, Cause, effects, and control measures of:Air Pollution, Water pollution, Soil pollution, Noise pollution, Marine Pollution. Role of an individual in prevention of pollution – Pollution case studies.

Environmental Policies: Wildlife Protection Act 1972 – Forest Conservation Act 1980 –Air pollution prevention and control Act 1981- Environmental Protection Act 1986 and 2006 .

SOLID WASTE MANAGEMENT: Causes**,** effects, and control measures of urban and industrial wastes

Sustainable development – Goals of sustainability, International agreements- Montreal Protocol, Kyoto Protocol, Convention of Biological Diversity (CBD), Carbon Credits & Carbon Footprints

UNIT- V

[6 Hours]

Environmental Management
EIA and EA: Introduction, definition, scope, objectives, and methodology.
Disaster management: Definition, floods, earthquakes, cyclones, and landslides.
International Movements: Chipko, Silent Valley, Bishnois of Rajasthan
Ecotourism: Definition, principles, advantages, and disadvantages
Environmental Diary

Field Trip

Fieldwork/Environmental Visit: Visit a local area to document environmental assets – reserve forest/ eco-tourist spot: Visit a local polluted site - Study the local environment - common plants, insects, birds - Study simple ecosystems –pond, river, hill slopes, etc - Visit industries/water treatment plants/effluent treatment plants.

Text Books:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Palaniswamy – Pearson education
3. Environmental Studies by Dr.S.AzeemUnnisa, Academic Publishing Company

Reference Books:

1. Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications.
2. Textbook of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
3. Comprehensive Environmental studies byJ.P.Sharma, Laxmi publications.
4. Environmental sciences and engineering – J.Glynn Henry and Gary W. Heinke – Prentice hall of India Private Limited.
5. A Textbook of Environmental Studies by G.R.Chatwal, Himalaya Publishing House Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Prentice hall of India Private limited

E-Books: (Specify links)

1. http://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf
2. http://www.alljntuworld.in/download/environmental-studies-es-material-notes/
3. http://collegesat.du.ac.in/UG/Envinromental%20Studies_ebook.pdf
4. http://download.nos.org/333courseE/5.pdf
5. http://download.nos.org/333courseE/10.pdf
6. http://www.setju.ac.in/Environmental_Studies/Text/Social_Issues_and_the_Environment_Unit_6/env_studies.pdf

II B. TECH - II SEMESTER SYLLABUS

II Year – II Semester	B. Tech. (CSE-CS) – VR22	L	T	P	C
Course Code : 1000222100	Discrete Mathematical Structures	3	0	0	3

COURSE OBJECTIVES:
1. To introduce the algorithmic approach to the solution of problems, which is fundamental in discrete mathematics and this approach reinforces the close ties between this discipline and the area of computer science.
2. To introduce basic logical connectives and inference theory.
3. To Familiarize closed form solution of linear recurrence relations by various methods.
4. To perform the operations associated with sets, functions and relations.
5. To bring awareness of basic concepts of graphs and explaining related algorithms.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	**Develop** reasoning skills using Mathematical Logic concepts.	PO1, PO2 PO3	2 2 3
CO2	**Evaluate** the solutions for various problems using recurrence relations.	PO1, PO2	1 2
CO3	**Construct** Hasse diagrams and Understand the concept of Algebraic Structures.	PO1 PO2 PO3	1 2 2
CO4	**Apply** the concepts of graph theory for a given problem.	PO1 PO2 PO3 PO12	1 2 3 3

UNIT- I
MATHEMATICAL LOGIC [12 Hours]

Propositional Logic: Connectives- negation, conjunction, disjunction, conditional and bi-conditional, well-formed formulae, tautologies, equivalence of formulae, tautological implications, Disjunctive and Conjunctive normal forms, Rules of inference and examples, Consistency of premises.
Predicative Logic: Statement Functions, Variables and Quantifiers, Free and Bounded variables, Inference theory for predicative logic.

UNIT- II
RECURRENCE RELATIONS [8 Hours]

Recurrence relations: Recurrence relations, solving homogeneous linear recurrence relations by characteristic roots method, solving non-homogeneous linear recurrence relations.

UNIT- III

SETS AND RELATIONS AND ALGEBRAIC STRUCTURES **[10 Hours]**

Sets: Sets, Operations on Sets, Principles of Inclusion–Exclusion, Pigeonhole Principle and its Application.

Relations: Definition, representation, types of relations: equivalence relation, equivalence class, partial order, Hasse iagram and total order relations.

Functions: Definition, types of functions: surjective, injective and bijective.

Algebraic Structures: Binary operations, Algebraic structures, Group, Abelian Group, Subgroups, Lagrange's theorem on finite groups.

UNIT- IV

GRAPH THEORY **[10 Hours]**

Graph theory: Definitions, finite and infinite graphs, incidence and degree, isolated and pendant vertices, isomorphism, sub graphs, connected and disconnected graphs, simple graph, complete graph, bipartite graph, complete bipartite graph, planar graph, Isomorphic Graphs, Euler formula(without proof) and Graph colouring, Walk, path and circuit, Euler graph, Hamiltonian Graph.

UNIT- V

TREES **[8 Hours]**

Trees: Some properties of trees, rooted and binary trees, spanning trees, BFS & DFS Algorithms, Minimal spanning trees, Kruskal's algorithm.

Textbooks:
1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 1997.
2. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.
3. Joe L. Mott, Abraham Kandel and T. P. Baker, Discrete Mathematics forcomputer Scientists& Mathematicians, 2/e, Prentice Hall of India Ltd, 2012.

Reference Books:
2. S. Santha and E. V. Prasad Mathematical Foundation for Computer Science, Cengage,2017.
3. Discrete Mathematical Structures, BernandKolman, Robert C. Busby,Sharon Cutler Ross, PHI.
4. Discrete Mathematics, S. K. Chakraborthy and B.K. Sarkar, Oxford, 2011.
5. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3rdEdition, Tata McGraw.

II Year – II Semester	B. Tech (CSE-CS) – VR22	L	T	P	C

Course Code : 1005222200	**Database Management Systems**	3	0	0	3

COURSE OBJECTIVES:
1. Provide students with theoretical knowledge and practical skills in the use of database and database management systems in information technology applications.
2. The logical design, physical design and implementation of relational databases are covered.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:
CO1	Describe ER model and normalization for database design.
CO2	Create, maintain and manipulate a relational database using SQL.
CO3	Design and build database system for a given real world problem.
CO4	Examine issues in data storage and query processing and can formulate appropriate solutions.

UNIT- I

Introduction to Database Systems, File System Vs DBMS, Advantages of DBMS, Structure of DBMS, Levels of Data Abstraction (Data Independence), Database Users and Administrators, Different Data Models.
E-R Model: Overview of Database Design, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model   **[8 Hours]**

UNIT-II

Introduction to the Relational Model, Relational model constraints over relations. Relational Algebra and calculus   **[8 Hours]**

UNIT-III

SQL Queries: The Form of Basic SQL Query, Union, Intersect and Except-Nested Queries-Aggregative Operators- Group By and Having Clauses-Null Values-Outer Joins.
Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF),De-normalization.
[**8 Hours]**

UNIT-IV

Overview of Storage and Indexing: Data on External Storage – File Organization and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing.   **[8 Hours]**

UNIT-V

Query processing, Transaction Management, Concurrency Control and Crash recovery Transactions: Acid Properties of Transaction - Transaction States - Schedule: Serial Schedule Concurrent Schedules - Anomalies Associated With Concurrent Schedules (RW WR - and WW Conflicts) -Serializability – Conflict Serializability - and View Serializability. Introduction to Lock Management-Lock Based Concurrency Control: 2pl- Strict 2pl Concurrency without Locking, Timestamp–Based Concurrency Control – Optimistic Concurrency Control. Introduction to ARIES - The Log - The Write-Ahead Log Protocol Check Pointing. **[8 Hours]**

Text Books:

1. Database System Concepts. 6/e Silberschatz, Korth, TMH
2. Database Management System, 6/e RamezElmasri, Shamkant B. Navathe, PEA

Reference Books:

1. Introduction to Database Systems, 8/e C J Date, PEA
2. The Database book principles & practice using Oracle/MySqlNarainGehani, University Press.
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

II Year – II Semester	B. Tech (CSE-CS) – VR22	L	T	P	C
Course Code : 1005222103	**Programming Essentials in Python**	3	0	0	3

COURSE OBJECTIVES:

1. To learn about Python programming language syntax, semantics, and the runtime environment.
2. To be familiarized with universal computer programming concepts like data types, containers.
3. To be familiarized with general computer programming concepts like conditional execution, loops & functions.
4. To be familiarized with general coding techniques and object-oriented programming

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:
CO1	Create the environment and run basic programs by make use of fundamental concepts
CO2	Apply knowledge of Python constructs for developing programs/applications.
CO3	Import packages to the current working environment and create user defined modules.
CO4	Implement object oriented concepts and handle exceptions and files

UNIT- I

INTRODUCTION TO PYTHON:
History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation. Types, Operators and Expressions: Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations. Control Flow-: if, if-elif-else, for, while, break, continue, pass.   **[6 Hours]**

UNIT- II

STRINGS and DATA STRUCTURES:
Strings: Strings and text files, String manipulations: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa. Binary, octal, hexadecimal numbers, Data Structures: Lists, tuples, and dictionaries; basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries.
                                                                                                    [8 Hours]

UNIT- III

FUNCTIONS:
Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables. Modules: Creating modules, import statement, from, name spacing, Python packages Introduction to PIP, Installing Packages via PIP, Using Python Packages.   **[8 Hours]**

UNIT- IV

INTRODUCTION TO OOPS:
Classes and Objects: Introduction, classes and objects, class method and self-argument, init() method, class and object variables, del() method, other special methods, public and private data members, private methods, calling a class method from another class method, built-in class attributes, garbage collection, class and static methods, Inheritance: Introduction, inheriting classes in python, types of inheritance, composition/containership/complex objects, abstract classes and interfaces, Meta class.   **[8 Hours]**

UNIT- V

OPERATOR OVERLOADING AND EXCEPTION HANDLING
Operator Overloading: Introduction, implementing operator overloading, reverse adding, overriding__getitem__() and __setitem__() methods, overriding the in operator, overriding miscellaneous functions, overriding the _call__() method.
Error and Exception Handling: Introduction to errors and exceptions, handling exceptions, multiple except blocks, multiple exceptions in a single block, except block without exception, the else clause, raising exceptions, built-in and user-defined exceptions, the finally block.

[10 Hours]

Text Books:
1. Reema Thareja,"Python Programming Using Problem Solving Approach", Oxford University Press,2019.
2. Zed Shah, "Learn Python The Hard Way", Third edition, Addison-Wesley, 2013.

Reference Books:

1. Charles Severance, " Python for Informatics- Exploring Information", 1st edition Shroff Publishers,2017.
2. John V. Guttag, "Introduction to Computation and Programming Using Python", The MIT Press,
3. W.Chun , "Core Python Programming", 2nd Edition, Prentice Hall, 2006.

4. Core Python Programming - Covers Fundamentals to Advanced Topics Like OOPS, Exceptions, Data Structures, Files, Threads, Networking, GUI, DB Connectivity and Data Science Second Edition (English, Paperback, Rao R. Nageswara)

E-Books: https://www.python.org/doc/

NPTEL/MOOC:

1. https://nptel.ac.in/courses/106/106/106106182/

2. https://nptel.ac.in/courses/106/106/106106145/

II Year – II Semester	B. Tech. (CSE-CS) – VR22	L	T	P	C
Course Code : 1046222200	Applied Cryptography	3	0	0	3

COURSE OBJECTIVES:

1. To learn the principles and practice of applied cryptography.
2. To gain knowledge in Classical systems, symmetric block ciphers (DES, AES, other contemporary symmetric ciphers)
3. To gain Knowledge in Public-key cryptography (RSA, discrete logarithms), Algorithms for factoring and discrete logarithms, cryptographic protocols, hash functions, authentication, key management, key exchange, signature schemes.
4. To gain knowledge in message integrity, MAC, SHA, MD5.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:
CO1	Understanding the principles and practices of Applied cryptography
CO2	Understanding the concepts of symmetric block cipher or conventional key encryption or private key encryption or one key encryption.
CO3	Apply basic knowledge of public key cryptography or asymmetric key cryptography or two key cryptography
CO4	Understanding the message integrity.

UNIT- I

Introduction to cryptography

Definition of cryptography, security goals, Services and Mechanisms Cryptographic Attacks, , model for Network security, encryption with perfect secrecy, one-time pad.

UNIT- II

Introduction to Modern Symmetric Key Ciphers, classical cryptography shift cipher , mono alphabetic substitution cipher, poly alphabetic substitution cipher.

UNIT- III

Symmetric encryption: Block ciphers, Feistel networks, Data Encryption Standard (DES), Triple-DES, Advanced Encryption Standard(AES),

Stream ciphers: RC4, **Software-optimized Encryption Algorithm (SEAL),** modes of operations.

UNIT- IV

Asymmetric encryption: Introduction to public key cryptography, constructions of RSA , El Gamal, Diffie Hell man key exchange, hybrid encryption:

UNIT- V

Message Integrity: Message Authentication, applications of Hash function, Cryptographic Hash Functions based MACs, cryptographic Hash Functions(SHA 512,SHA 3), MD 5.

Data Integrity, Digital Signature, Digital Signature Schemes & Key Management

Text Books:

1.   Cryptography and Network Security, Behrouz A Forouzan, DebdeepMukhopadhyay, (3e) Mc Graw Hill.
2.   Cryptography and Network Security, William Stallings, (6e) Pearson.
3.   Everyday Cryptography, Keith M.Martin, Oxford.

Reference Books:

1.   Network Security and Cryptography, Bernard Meneges, Cengage Learning.

II Year – II Semester	B. Tech (CSE-CS) – VR22	L	T	P	C
Course Code : 1005222210	Database Management Systems Lab	0	0	3	1.5

COURSE OBJECTIVES:
1. To provide a sound introduction to the discipline of database management as a subject in its own right, rather than as a compendium of techniques and product-specific tools.
2. To familiarize the participant with the nuances of database environments towards information oriented data-processing oriented framework.
3. To give a good formal foundation on the relational model of data
4. To present SQL and procedural interfaces to SQL comprehensively
5. To give an introduction to systematic database design approaches covering conceptual design, logical design and an overview of physical design

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:
CO1	Understand, appreciate and effectively explain the underlying concepts of database technologies
CO2	Design and implement a database schema for a given problem-domain
CO3	Normalize a database
CO4	Populate and query a database using SQL DML/DDL commands.

LIST OF EXPERIMENTS

S. No.	Name of the experiment	Skill
1.	**Exercise – 1** Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.	Creating Tables
2.	**Exercise – 2** Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.	Queries

3.	**Exercise – 3** Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.	Queries
4.	**Exercise – 4** Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc,round, to_char, to_date)	Queries using conversion functions
5.	**Exercise – 5** Creation of a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found).	PL/SQL Programs
6.	**Exercise – 6** Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.	Commit and Rollback
7.	**Exercise – 7** Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.	Programs using Case
8.	**Exercise – 8** Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE- APPLICATION ERROR.	Programs using Loops
9.	**Exercise – 9** Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.	Procedures
10.	**Exercise – 10** Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.	Stored Functions
11.	**Exercise – 11** Program development using creation of package specification, package bodies, private objects, package variables and cursors and calling stored packages.	Package
12.	**Exercise – 12** Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR,WHERE CURRENT of clause and CURSOR variables.	Cursors

13.	**Exercise – 13** Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers.	Triggers
14.	**Exercise – 14** For a given set of relation tables perform the following: a. Creating Views b. Dropping Views c. Selecting from a View	Views

Text Books:

1. Database System Concepts. 6/e Silberschatz, Korth, TMH
2. Database Management System, 6/e RamezElmasri, Shamkant B. Navathe, PEA

Reference Books:

1. Introduction to Database Systems, 8/e C J Date, PEA
2. The Database book principles & practice using Oracle/MySqlNarainGehani, University Press.
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

II Year – II Semester	B. Tech (CSE-CS) – VR22	L	T	P	C
Course Code : 1005222113	**Programming Essentials in Python Lab**	0	0	3	1.5

COURSE OBJECTIVES:

1. To learn about Python programming language syntax, semantics, and the runtime environment.
2. To be familiarized with universal computer programming concepts like data types, containers.
3. To be familiarized with general computer programming concepts like conditional execution, loops & functions.
4. To be familiarized with general coding techniques and object-oriented programming.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:
CO1	Analyze the given Python program to identify bugs and to rectify it.
CO2	Apply knowledge of Python constructs for developing programs/applications.
CO3	Implement object oriented concepts and exception handling mechanism.
CO4	Use Numpy and pandas libraries for handling data.

LIST OF EXPERIMENTS

S. No.	Name of the experiment	Skill
1.	**Exercise – 1** a. Practice Python Installation b. Declaration of Variables, identifiers and type conversions c. Write simple programs by defining variables and assigning values of different basic data types d. Write programs to know data type of a variable using Type statement e. Write programs to do multiple assignments at a time f. Write programs for writing multiple statements in a single line g. Use Input statement, type conversion	Python installation

	h. Use different operators in programs	
2.	**Exercise -2** Python programs on Decision Control Statements a. Write programs using selection statements b. Implement programs on and conditional branching statements	Decision Control Statements
3.	**Exercises -3** Python programs on looping control structures a. Design and develop programs using Iterative statements-while, for, nested loops b. Use Break, continue, pass statements in programs c. Understand the usage of else statement in loops with a case study	looping control structures
4.	**Exercise -4** Identify the need and importance in the creation of Python Functions and Modules a. Write programs for defining and calling functions b. Understand Scope of a variable and Use global statement c. Differentiate fruitful and void functions through a case study d. Apply recursive and Lambda functions e. Understand different kinds of arguments through a case study f. Installing and usage of standard library modules g. Use python packages	Identify the need and importance in the creation of Python Functions and Modules
5.	**Exercise -5** Solve the problems using Strings and understanding the methods and operations on Lists a. Apply string formatting operator b. Use built in string methods, functions and regular expressions c. Define a list and write programs to access and modify elements of a list d. Practice basic list operations, methods e. Write programs to use list as a stack and queue	Solve the problems using Strings and understanding the methods and operations on Lists
6.	**Exercise -6** Programs on the implementation of methods and operations of List data structure a. Define a list and write programs to access and modify elements of a list b. Practice basic list operations, methods c. Write programs to use list as a stack and queue	Programs on the implementation of methods and operations of List data structure
7.	**Exercise -7** Implement programs to solve the problems using Python other data structures: Tuples and Dictionaries	Implement programs to solve the

	a. Write programs to define a dictionary and write programs to modify values, adding new keys b. Apply looping over a dictionary c. Use built in dictionary methods, functions d. Create a tuple and assign values e. Use basic tuple operations and comparisons	problems using Python other data structures: Tuples and Dictionaries
8.	**Exercise -8** Implement the Python Classes and Objects to address the real-world scenarios a. Define classes and objects using python for the real-world scenario b. Defining constructors and using Self c. Understand public and private members d. Practice calling class methods from another class e. Write built in functions to check, get, set and delete attributes	Implement the Python Classes and Objects to address the real-world scenarios
9.	**Exercise -9** Develop the programs to implement parent-child relationship a. Demonstrate different inheritance types b. Apply polymorphism and method overriding c. Create abstract classes	Develop the programs to implement parent-child relationship
10.	**Exercise -10** Write the programs to address the exceptions via exception handling in the development of solutions and implement operator overloading a. Write a simple exception handling program with try-except b. Write a program for catching multiple exceptions c. Demonstrate raising and re raising exceptions d. Apply else and finally clauses e. Demonstrate the usage of polymorphism in overloading of operators	Write the programs to address the exceptions via exception handling in the development of solutions and implement operator overloading

Text Books:

1. Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson

Reference Books:

1. Introduction to Python Programming, Gowrishankar. S, Veena A, CRC Press.
2. Programming and Problem Solving with Python, Ashok Namdev Kamthane, Amit Ashok Kamthane, TMH, 2019.
3. https://www.tutorialspoint.com/python3/python_tutorial.pdf

II Year – II Semester	B. Tech (CSE-CS) – VR22	L	T	P	C
Course Code : 1005222280	ESSENTIALS FOR COMPETITIVE CODING (SKILL ORIENTED COURSE)	1	0	2	2

COURSE OBJECTIVES:

1. To improve logical and analytical skills
2. To improve programming patterns like recursion

COURSE OUTCOMES:

COs	At the end of the course, the student will have the ability to:
CO1	Apply bit manipulation techniques to solve problems
CO2	Apply the modular programming techniques to simplify the programs
CO3	Able to solve problems using strings

S. No.	Name of the Experiment
1	Bit Manipulations
2	Number theory: primality
3	Number theory: combinatorics
4	Recursions
5	Arrays
6	String Manipulations
7	Time and Space complexity optimization
8	Types of Errors

.

Text Books:

1. Problem Solving and Program Design in C, Jeri R. Hanly, Ellot B. Koffman,7th
Program Structure & Detailed Syllabus (VR-20)
Department of Artificial Intelligence & Data Science Page 94
Edition,Pearson.
2. 101 Programming puzzle problems solved: High School Junior to Seniors Join us to win
Informatics Olympiad, N.B.Venkateswarlu, Feb, 2015.

Reference Books:
1. Programming in C, PradipDey, Manas Ghosh, 2nd Edition, OxfordUniversityPress.
2. How to Solve it by Computer- R.G.Dromey,PHI.

E-Books:
https://graphics.stanford.edu/~seander/bithacks.html

NPTEL/MOOC:
https://onlinecourses.nptel.ac.in/noc21_cs99/preview

II Year – II Semester	B. Tech (CSE-CS) – VR22	L	T	P	C
Course Code : 1005222270	**Mini Project (EPICS: Engineering Projects in Community Service)**	0	0	2	1

Course Overview:

Course will explain the importance of engineers in the society. It will give a brief understanding of various social and global issues of the world. Course reminds that every engineer has a responsibility to solve the social problems of world, to make the world a better place to live-in. In the process of serving the society, students need to identify a community problem for which a community project needs to be developed. After successful completion of project, the Project needs to be submitted to community for their benefit. For the effective development of the project, concepts like 'Design thinking' & 'Project management' will be taught in the course. In addition to that, various platforms like IoT, 3D Printing, Mobile app etc. will be explained which will be useful for effective project development.

Course Objectives

Course objective is to remind students, that every engineer has a responsibility to serve the society. As part of fulfilling the responsibility, Students will create an Engineering project in the service of community. Students will learn the necessary concepts & technologies to develop effective projects

Course Outcomes with Bloom's Taxonomy level and PO mapping:

	Course outcome	Bloom's taxonomy	Bloom's Taxonomy Level	PO
CO1	**Understand** the various social problems present in the world & they will be able to identify and select a community problem to develop a technological project.	Understanding, Identifying	L2 L3	PO-1, PO-2 PO-6, PO-9 PO-10
CO2	**Learn** the concepts of Design Thinking and Project management. **Learn** the technologies like Internet of Things, 3D Printing, Mobile App Creation, Thinker CAD, and Web page development.	Understanding	L2	PO-3, PO-5, PO-11
CO3	**Apply** the engineering knowledge, mathematics, design thinking and project management to **develop** a community project.	Applying, Testing Summarize, Develop Validate	L3, L4 L5, L6 L6	PO-1, PO-2, PO-3, PO-5 PO-6, PO-7, PO-9, PO-10

				PO-11,
CO4	Students will submit the project to the intended community and feedback to be collected from community. Any future support also will be provided by the students.	Understanding	L2	PO-1, PO-6, PO-8 PO-12

UNIT- I   L: 08

ENGINEER'S CONTRIBUTION TO SOCIETY :

Major roles played by engineers in building a society – Importance of engineers to society – Various global issues, social problems & problems faced by different communities in the world – Engineering inventions which reduced the impact of many social problems.

EPICS:

Introduction to EPICS – Learning pedagogies - History of EPICS – Case studies of various EPICS projects of Purdue university – Case studies of various EPICS projects in India– Community visit – Selection of a community project by visiting a community / Studying about a community.

UNIT II   L: 08

DESIGN THINKING & PROJECT MANAGEMENT:

DESIGN THINKING:

Introduction to Design Thinking – Case study for design thinking process(IDEO)– Requirement & Specifications from Users and community partners – Ideation and Concept generation – Design and Prototyping – Testing & Redesign – Detailed design and delivery.

PROJECT MANAGEMENT:

Introduction to Project & Project Management – Project Management Process – Stake Holders – Agile Practices in Project Management – Project management tools (Checklist, Precedence Table, Timeline using Gantt Chart) – Advanced project management tools – Significance of Documentation.

UNIT-III   L: 10

PLATFORMS FOR DEVELOPING COMMUNITY PROJECTS:

Various platforms are used for developing projects. Some of the platforms used for project

development are

     a.   Internet of Things (IoT) & Embedded Systems
     b.   3D Printing
     c.   Thinker CAD
     d.   Mobile App creation
     e.   Web Development

Internet of Things (IoT)& Embedded Systems:

Introduction to Internet of Things (IoT) & Embedded systems – Difference between IoT & Embedded systems - Before IoT vs. After IoT - Stages of IoT - Components of IoT & Embedded systems (boards, sensors, actuators) - Programming of IoT & interfaces to hardware- Cloud integration & Data collection - Application of IoT & future scope

3D Printing:

Introduction to 3D Printing - Before and After 3D Printing - Components for 3D Printing - Types of 3D Printing - Steps for creating a 3D Model - Scope of 3D Printing - 3D Milling, Laser cutting, 3D Carving machine using 3D Printing technology

Thinker CAD:

Thinker CAD circuit making: Circuit Design - Programming – Simulate

Thinker CAD 3D Modelling: Place – Adjust – Combine - 3D Print

Mobile App Creation:

1. Applications and Scope of Mobile Apps in society
2. Tools for creation of mobile apps (MIT APP, Apps Geyser & Appy Builder)

Web Development:

1. Applications / Need for Webpage
2. Tools (various websites) for creation of Web pages (Wix, Weebly & GoDaddy)

UNIT-IV   **P: 12**

PROJECT DESIGN& PROTOTYPING:

Defining the Problem – Requirements & Specifications from Users / Community partners – Detailed Design – Creating a Prototype by considering key parameters.

UNIT-V   **P: 12**

PROJECT TESTING & SUBMISSION:

Prototype testing – Analyzing the performance of prototype – Redesign (in case of testing failure) – Submission to community partners / beneficiaries – taking the feedback for improvement of the project.

Reference Papers:

1. **EPICS:** Engineering projects in community service*, Edward j. Coyle, Leah H. Jamieson and William C. Oakes, International Journal of Engineering Education, 2005

Web links:

1. https://en.wikipedia.org/wiki/List_of_global_issues
2. https://engineering.purdue.edu/EPICS/purdue/role-specific/purdue/team-documents/design-documents - For Design thinking
3. https://www.coursera.org/learn/uva-darden-project-management
4. https://www.coursera.org/specializations/project-management
5. https://www.coursera.org/learn/introduction-iot-boards - Learn IoT.
6. https://en.wikipedia.org/wiki/3D_printing
7. https://www.coursera.org/learn/3d-printing-applications
8. https://www.tinkercad.com/ - For Thinker CAD
9. https://appinventor.mit.edu/- For creating MIT Mobile APP
10. http://appybuilder.com/ - For Creating own mobile app
11. https://www.weebly.com/in - For creating own websites
12. https://www.wix.com/ - For Creating own websites

II Year – II Semester	B. Tech (CSE-CS) – VR22	L	T	P	C
Course Code : 1000222121	Life Skills	2	0	0	0

COURSE OBJECTIVE:

The students will be able to build self-confidence, encourage critical thinking, foster independence and help people to communicate more effectively.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Build Self Confidence and Interpersonal and Intrapersonal relationships.	PO12 PO10 PO9	3 3 3
CO2	Practice Emotional Competency while communicating with others	PO12 PO10 PO9	3 3 3
CO3	Gain Intellectual Competency by practicing ethics and morals	PO12 PO10 PO8	3 3 3

**Strength of mapping (Intensity Scale) – 1(Lightly mapped), 2(Moderately mapped), 3(Heavily mapped)

UNIT1: LIFE SKILLS: Time Management, Goal setting: short term, Long Term. (Activity has to be conducted)

UNIT2: EMOTIONAL INTELLIGENCE: Self Awareness through Johari Window and SWOT analysis (Activity has to be conducted)

UNIT3: PUBLIC SPEAKING: Body Language, presentation skills, impromptu presentation, interviewing others. (Activity has to be conducted)

UNIT 4: NPTEL Course/ Coursera /Any relevant Certificate Course has to be done

Assessment: In order to clear internal assessment, the student has to submit Project Report and give Presentation on all the activities he/she has done during the course. The student has to do a certificate course also. (Presentation, Project Report and Certificate in total will be the criteria for the assessment)

References:

- Life Skills & Personality Development – Maithry Shinde, Jyotsna Sreenath, Krishna Chaitanya_Cambridge University Press – 2022.