

Academic Regulations
Program structure & Detailed Syllabus
VR22

For

Under Graduate Programme (B. Tech)

INFORMATION TECHNOLOGY

(Applicable For Batches Admitted From 2022 – 2023)



VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY
(AUTONOMOUS)

DUVVADA - VISAKHAPATNAM – 530 049

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

ACADEMIC REGULATIONS

VR 22

B. Tech Program (IT)

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.

$$\text{SGPA (Si)} = \Sigma(C_i \times G_i) / \Sigma C_i$$

Where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} 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.

$$\text{CGPA} = \Sigma(C_i \times S_i) / \Sigma C_i$$

Where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

Conversion of CGPA to Percentage:

$$\text{Equivalent Percentage} = (\text{CGPA} - 0.75) \times 10$$

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 from 160 Credits.
First Class with Distinction	≥ 7.75 with no failures	
First Class	≥ 6.75	
Second Class	≥ 5.75 to < 6.75	

Lateral- entry scheme

Class Awarded	CGPA to be secured	From the CGPA secured from 121 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

- Where the words 'he', 'him', 'his', occur, they imply 'she', 'her', 'hers', also.
- The academic regulations should be read as a whole for the purpose of any interpretation.
- In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman, Academic Council is final.
- 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
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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 or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered 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	Expulsion from the examination hall and cancellation of performance in that course

	arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	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 answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
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.

**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 be taken.
- 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 pursuing 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 pursuing 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:
VISAKHAPATNAM**

**DEPARTMENT OF INFORMATION TECHNOLOGY
PROGRAM STRUCTURE – VR-22**

I Year

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	1005221110	Problem Solving and Programming using C Lab	0	0	3	1.5
8	1000221170	Engineering Exploration Lab	0	0	2	1
9	1000221120	Game, Sports and Yoga	2	0	0	0
Total Credits						18

I Year

II Semester

S. No.	Course Code	Course Title	L	T	P	C
1	1000221103	Linear Algebra and Tensors	3	1	0	3
2	1000221205	Biochemistry	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	1000221212	Biochemistry Lab	0	0	3	1.5
8	1005221212	Web Design Lab	0	0	3	1.5
9	1000221114	Applied Physics Lab	0	0	3	1.5
10	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 – IT- VR22	L	T	P	C
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 – IT- VR22	L	T	P	C
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 a) Write a C Program to Find Whether the Given Number is i)Strong number ii)perfect number	Loops and Control Statements

	b) Write a C Program to print the following between 1 to n i) Prime Number ii) Armstrong Number	
6.	<p>Exercises –6: Pattern Problems</p> <p>Write a program to display the following pattern.</p> <pre> 1 1 2 1 2 3 1 2 3 4 1 2 3 4 5 * * * * * * * * * * * * * * * • ** *** **** ***** ***** A A B A B C A B C D A B C D E A B C D E F </pre>	Pattern problems
7.	<p>Exercises –7:</p> <p>https://www.hackerrank.com/domains/algorithms?filters%5Bstatus%5D%5B%5D=unsolved&filters%5Bstatus%5D%5B%5D=solved&filters%5Bskill%5D%5B%5D=Problem%20Solving%20%28Basic%29&filters%5Bdifficulty%5D%5B%5D=easy&filters%5Bsubdomains%5D%5B%5D=warmup&badge_type=problem-solving</p> <p>Note: minimum of 5 problems to be solved</p>	Introduction to online coding platform hacker rank
8.	<p>Exercise -8Demonstration of arrays& Strings</p> <p>a) Write a C program to perform Linear Search</p> <p>b) Write a C program to perform transpose of two matrices</p> <p>c) Write a C program to perform multiplication of two matrices</p> <p>d) Implementation of string manipulation operations with and without library function.</p> <p>i)copy ii) concatenate iii)length iv)compare</p>	Arrays and Strings
9.	<p>Exercise -9</p> <p>a) Write a C program to find cube of any number using function.</p> <p>b) Write a c program to find area and volume of geometric shapes using functions.</p> <p>c) Write a C program to check whether a number is even or odd using</p>	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 B. TECH - II SEMESTER SYLLABUS

I Year – II Semester	B. TECH – IT- VR22	L	T	P	C
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/Strastrup4th.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 – IT- VR22	L	T	P	C
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 – IT- VR22	L	T	P	C
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, Robert W Sebesta, 7ed, Pearson.
2. Web Technologies, Uttam K Roy, Oxford
3. The Web Warrior Guide to Web Programming, Bai, Ekedahl, Farrell, Gosselin, Zak, Karparhi, MacIntyre, 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 – IT- VR22	L	T	P	C
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

		on
4.	Exercise – 3 a) Write a program illustrating Inline Functions 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	Functions// Need to 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.	Polymorphis m
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. e) Write a Program to implement set and set Operations.	STL// Need to Complete Exercises on Hacker Rank

	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 Learning.
3. Computer programming with C++,kunal Pimparkhede,cambridge

I Year – II Semester	B. TECH – IT- VR22	L	T	P	C
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 <ul style="list-style-type: none"> • Title of web page • Heading styles • Various Text formatting tags 	Web Page Design
2.	Exercise – 2 Design Web page to illustrate the following <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • Various List types • Display the class time table using table tag 	Web Page Design
4.	Exercise – 4 Design Web page to illustrate the following <ul style="list-style-type: none"> • Web page navigation (self and new page) • Implement image as web page navigation 	Web Page Design
5.	Exercise – 5	CSS

	Implement the various CSS <ul style="list-style-type: none"> • Inline CSS • Internal CSS • External 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, Robert W Sebesta, 7ed, Pearson.
2. Web Technologies, Uttam K Roy, Oxford
3. The Web Warrior Guide to Web Programming, Bai, Ekedahl, Farrell, Gosselin, Zak, Karparhi, MacIntyre, 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



DEPARTMENT OF INFORMATION TECHNOLOGY
PROGRAM STRUCTURE – VR-22

II B. Tech I Semester (Second Year) – SEM-3								
S. No	Category	CC	Course Title	Category	Hours per week			Credits
					L	T	P	C
1	Basic Science courses		Discrete Mathematical Structures	BS	3	0	0	3
2	Professional Core Course		Data Structures	PC	3	0	0	3
3	Professional Core courses		Java Programming	PC	3	0	0	3
4	Professional Core courses		Operating Systems	PC	3	0	0	3
5	Professional Core courses		Software Engineering	PC	3	0	0	3
6	Professional Core courses (LAB)		Data Structures Lab	PC	0	0	3	1.5
7	Professional Core courses (LAB)		Java Programming Lab	PC	0	0	3	1.5
8	Professional Core courses (LAB)		Unified Modelling Lab	PC	0	0	3	1.5
9	Skill oriented course*		UNIX/R/Embedded C Programming	SC	1	0	2	2
10	Mandatory/Audit Course		Environmental Science	AC	2	0	0	0
Total credits								21.5

II B. TECH - I SEMESTER SYLLABUS

II Year – I Semester	B. Tech (IT) – VR22	L	T	P	C
Course Code :	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 Trees, 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 Horowitz, 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 Samanta, 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 (IT) – VR22	L	T	P	C
Course Code :	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 (IT) – VR22	L	T	P	C
Course Code :	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 (IT) – VR22	L	T	P	C
Course Code :	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 Jawadkar, 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 (IT) – VR22	L	T	P	C
Course Code	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 (IT) – VR22	L	T	P	C
Course Code :	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 $ax^2+bx=0$. 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 d) Write a JAVA program for creation of User Defined Exception. e) Write a Program to implement set and set Operations.	Exceptions

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 2016 by R. Nageswara Rao

II Year – I Semester	B. Tech (IT) – VR22	L	T	P	C
Course Code :	Unified Modelling Lab	0	0	3	1.5

Course Overview:

The analysis, design, coding, documentation, database design of mini project which will be carried out in 2nd year can be done in object-oriented approach using UML and by using appropriate software which supports UML.

Course Objectives:

- Construct UML diagrams for static view and dynamic view of the system.
- Generate creational patterns by applicable patterns for given context.
- Create refined model for given Scenario using structural patterns.
- Construct behavioral patterns for given applications.

Course Outcomes:

- Understand the Case studies and design the Model.
- Understand how design patterns solve design problems.
- Develop design solutions using creational patterns.
- Construct design solutions by using structural and behavioral patterns.

Detailed Syllabus

LIST OF EXPERIMENTS

Experiment Number	Name of the Experiment	Skill
1	Familiarization with Rational Rose or Umbrello	Design software project in the form of Graphical representation
2	CASE STUDY: CUSTOMER SUPPORTING SYSTEM (Online Book store) a)Identify and analyze events b)Identify use cases c)Draw Event table d)Identify and analyze domain classes	Design customer supporting system in the form of Graphical representation

	e)Represent domain class diagram using rational rose	
3	CASE STUDY: POINT OF SALE TERMINAL a)Identify and analyze events b)Identify Use cases c)Draw event table d)Identify and analyze domain classes e)Represent use cases and domain class diagram using rational rose	In point of sale terminal we can perform the operations like Bar code scanning, Process sale, Close sale, Pay Bill. Tax calculation, Buy product.
4	CASE STUDY: LIBRARY MANAGEMENT SYSTEM a)Identify and analyze events b)Identify use cases c)Draw event table d)Identify and analyze domain classes e)Represent class diagram for library management system	Library Management System is a project which deals with how to register, accessing of book, issue of the books and renewal of the books from library.
5	CASE STUDY: RAILWAY RESERVATION SYSTEM a) Develop sequence diagrams for each use case b) Identify MVC classes / objects for each use case c) Communication diagrams for each use case showing interactions among all the three-layer objects d) Develop detailed design class diagram (use GRASP patterns for responsibility assignment)	Online Railway Reservation System is a project which deals with the process of online booking, cancellation of tickets and online payment will be done.
6	CASE STUDY: HOSPITAL MANAGEMENT SYSTEM a) Develop sequence diagrams for each use case. b) Develop Communication diagrams for each use case showing interactions among all the three-layer objects. c) Develop detailed design class model (use GRASP patterns for responsibility assignment).	It deals with the collection of patient's information, diagnosis details, etc. Traditionally, it was done manually.
7	CASE STUDY :ATM APPLICATION a) Draw usecase diagram b) Draw sequence diagram c) Activity diagram	ATM Application is a system which deals with performing all Banking Transactions like cash withdrawal, balance enquiry, taking a mini statement of the transactions performed by the user.
8	CASE STUDY:AUCTION APPLICATION a)Draw sequence diagram b)Draw collaboration diagram c)Draw Activity diagram	The online auction system is a design about a website where sellers collect and prepare a list of items they want to

		sell and place it on the website for visualizing.
9	CASE STUDY:MULTITHREDED AIRPORT SIMULATION a)Draw sequence diagram b)Draw collaboration diagram	The project is focused on controller and pilot assistance systems for approach and ground movements.
10	CASE STUDY:SIMULATED COMPANY a) Draw use case diagram b) Draw sequence diagram c) Draw state chart diagram	Simulated company is an example that shows the documents produced when undertaking the analysis and design of an application that's simulates a small manufacturing company.

II Year – I Semester	B. Tech (IT) – VR22	L	T	P	C
Course Code :	R-Programming (Skill Oriented Course)	1	0	2	2

Course Description:

R is rapidly becoming the leading language in data science and statistics. Today, R is the tool of choice for data science professionals in every industry and field. This Statistics with R programming course will help you master the Programming with R in five Sections. It covers the basic syntax, making you ready to undertake your own first data analysis using R. Starting from variables and basic operations, you will eventually learn how to handle data structures such as vectors, matrices, data frames and lists. In the final section, you will dive deeper into the graphical capabilities of R, and create your own stunning data visualizations and data perform various analysis of Regression models in Linear and Non Linear.

Course outcomes:

CO'S	COURSE OUTCOMES
CO1	Understand the R workspace and Programming with R
CO2	Access online resources for R and import new function packages into the R workspace
CO3	Apply math functions to calculate probability and statistical distributions and knowledge on Graphics in data visualization.
CO4	Understand and use linear, non-linear regression models, and classification techniques for data analysis

LIST OF EXPERIMENTS

i. Study of data analysis using MS-Excel (Prerequisite)

1. Study of basic Syntaxes in R

2. Implementation of vector data objects operations

3. Implementation of matrix, array and factors and perform va in R

4. Implementation and use of data frames in R
5. Create Sample (Dummy) Data in R and perform data manipulation with R
6. Study and implementation of various control structures in R
7. Data Manipulation with dplyr package
8. Data Manipulation with data.table package
9. Study and implementation of Data Visualization with ggplot2
10. Study and implementation data transpose operations in R

Text Books:

1. The Art of R Programming, Norman Matloff, Cengage Learning
2. R for Everyone, Lander, Pearson

Reference Books:

1. R Cookbook, Paul Teetor, Oreilly.
2. R in Action, Rob Kabacoff, Manning

II B. Tech II Semester (Second Year) – SEM-4

S. No	Category	CC	Course Title	Category	Hours per week			Credits
					L	T	P	
1	Engineering Science Courses		Database Management Systems	ES	3	0	0	3
2	Basic Science Course /Prof core course		Probability and Statistics	BS	3	0	0	3
3	Professional Core courses		Programming Essentials in Python	PC	3	0	0	3
4	Professional Core courses		Advanced Data Structures	PC	3	0	0	3
5	Humanities and Social sciences		Managerial Economics and Financial Analysis	HS	3	0	0	3
6	Engineering Science Courses/Prof Core		Database Management Systems Lab	ES	0	0	3	1.5
7	Professional Core courses (LAB)		Advanced Data Structures Lab	PC	0	0	3	1.5
8	Professional Core courses (LAB)		Programming Essentials in Python Lab	PC	0	0	3	1.5
9	Skill oriented course*		Java Script/Kotlin Programming/Go Programming	SC	1	0	2	2
10	Mini Project		Mini Project (EPICS)	PROJ	0	0	2	1
11	Mandatory/Audit course		Life Skills	MC	2	0	0	0
Total credits								22.5
Internship 2 Months (Mandatory) during summer vacation								
12			Honors/Minor Course		4	0	0	4

Total Credits (II YEAR – I & II SEM) = 44

II B. TECH - II SEMESTER SYLLABUS

II Year – II Semester	B. Tech (IT) – VR22	L	T	P	C
Course Code :	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 (IT) – VR22	L	T	P	C
Course Code :	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 (IT) – VR22	L	T	P	C
Course Code :	Advanced Data Structures	3	0	0	3

COURSE OBJECTIVES:

1. To be familiar with non-linear data structures such as Graphs
2. To emphasize the importance of dictionaries and Hashing for the faster retrieval
3. Develop effective digital search using tries
4. To implement M-way trees like B- Trees and B+ trees

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:
CO1	Implement various sorting algorithms
CO2	Implement variants of Binary Search Trees like AVL, Red-Black Tree
CO3	Implement heaps, queues and their operations, B Trees and B+ Trees
CO4	Illustration of tries which share some properties of table look up, various issues related to the design of file structures

UNIT- I

HASHING:

Dictionary ADT, Introduction-Static Hashing- Hash Table- Hash Functions- Secure Hash Function- Overflow Handling- Theoretical Evaluation of Overflow Techniques, Dynamic Hashing- Motivation for Dynamic Hashing -Dynamic Hashing Using Directories- Directory less Dynamic Hashing. **[8 Hours]**

UNIT-II

PRIORITY QUEUES:

Priority Queue ADT, Model, Simple Implementation, Binary Heap, Applications of Priority Queues- The Selection Problem Event Simulation Problem, Heap Sort, Binomial Queues- Binomial Queue Structure – Binomial Queue Operation- Implementation of Binomial Queues. **[8 Hours]**

UNIT-III

EFFICIENT BINARY SEARCH TREES:

Binary Search Tree, AVL Tree, Insertion into a AVL Tree, Deletion from a AVL Tree, Red-Black Trees, Definition, Representation of a Red- Black Tree, searching a Red-Black Tree, Inserting into a Red Black Tree, Deletion from a Red Black Tree. **[10 Hours]**

UNIT-IV

MULTIWAY SEARCH TREES:

M-Way Search Trees, Definition and Properties- Searching an M-Way Search Tree, B-Trees, Definition and Properties- Number of Elements in a B-tree- Insertion into B-Tree- Deletion from a B-Tree- B+-Tree Definition- Searching a B+-Tree- Insertion into B+-tree- Deletion from a B+-Tree. [8 Hours]

UNIT-V

DIGITAL SEARCH STRUCTURES:

Digital Search Trees, Definition- Search, Insert and Delete- Binary tries and Patricia, Binary Tries, Compressed Binary Tries- Patricia, Multiway Tries- Definitions- Searching a Trie- Sampling Strategies- Insertion into a Trie- Deletion from a Trie- Keys with Different Length- Height of a Trie- Space Required and Alternative Node Structure- Prefix Search and Applications- Compressed Tries- Compressed Tries With Skip Fields- Compressed Tries With Labelled Edges- Space Required by a Compressed Tries. [10 Hours]

Text Books:

1. Data Structures, a Pseudocode Approach, Richard F Gilberg, Behrouz A Forouzan, Cengage.
2. Fundamentals of DATA STRUCTURES in C: 2nded, , Horowitz , Sahani, Anderson-freed, Universities Press
3. Data structures and Algorithm Analysis in C, 2nd edition, Mark Allen Weiss, Pearson

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
4. File Structures :An Object oriented approach with C++, 3rded, Michel J Folk, Greg Riccardi, Bill Zoellick
5. C and Data Structures: A Snap Shot oriented Treatise with Live examples from Science and Engineering, NB Venkateswarlu& EV Prasad, S Chand, 2010.

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/>
4. <http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures>
5. <http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms>
6. <http://lcm.csa.iisc.ernet.in/dsa/dsa.html>
7. http://utubersity.com/?page_id=878

NPTEL/MOOC:

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

II Year – II Semester	B. Tech (IT) – VR22	L	T	P	C
Course Code :	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/DDI 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, NOT EXISTS, 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
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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 (IT) – VR22	L	T	P	C
Course Code :	Advanced Data Structures Lab	0	0	3	1.5

COURSE OBJECTIVES:

1. Describe and implement a variety of advanced data structures (hash tables, priority queues, balanced search trees, graphs).
2. Analyse the space and time complexity of the algorithms studied in the course.
3. Identify different solutions for a given problem; analyse advantages and disadvantages to different solutions

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:
CO1	To understand graph representations, Minimum Spanning Trees and traversals
CO2	Understand dictionaries, hashing mechanism which supports faster retrieval.
CO3	Implement heaps, queues and their operations, B Trees and B+ Trees
CO4	Illustration of tries which share some properties of table look up, various issues related to the design of file structures

LIST OF EXPERIMENTS

S. No.	Name of the experiment	Skill
1.	a) Implementation of Static Hashing (Use Linear probing for collision resolution) b) Implement Huffman coding.	Hashing
2.	Write a program to implement AVL tree operations	Balanced BST
3.	Write a program to implement Red- Black tree operations	Balanced BST
4.	Write a program to implement Binomial queues	Binomial Queue
5.	Write a program to implement Heap Sort	Heap Sort
6.	Write a program to implement B- Tree	B-Tree
7.	Write a program to implement B+ Trees	B+ Tree
8.	Construct Tries for the implementation of English Dictionary and Perform Searching of a word in dictionary.	Tries

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 – II Semester	B. Tech (IT) – VR22	L	T	P	C
Course Code :	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 h. Use different operators in programs	Python installation
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 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	Implement programs to solve the problems using Python other data structures: Tuples and Dictionaries
8.	Exercise -8 Implement the Python Classes and Objects to address the real-world scenarios	Implement the Python Classes and Objects to

	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	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 NamdevKamthane, Amit Ashok Kamthane, TMH, 2019.
3. https://www.tutorialspoint.com/python3/python_tutorial.pdf

II Year – II Semester	B. Tech (IT) – VR22	L	T	P	C
Course Code :	GO PROGRAMMING (SKILL ORIENTED COURSE)	1	0	2	2

COURSE OBJECTIVES:

- Learn about what makes Go a great language
- Learn how to install the Go tool chain
- Learn how to setup Visual Studio Code to edit and debug Go programs
- Learn how to work with the Go Playground to test and run snippets of Go code
- Learn and understand the basic Go language syntax and features

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:
CO1	Go Programming language fundamentals
CO2	Core Go language Concepts
CO3	Go language Control Structures
CO4	Go Array Program

LIST OF EXPERIMENTS

1. Golang Program to Print Hello World
2. Go Program to add Two Numbers
3. Go Program to Find the Compound Interest
4. Go Program to Print 1 to 100
5. Go Program to find Simple Interest
6. Go Program to Find the Cube of a Number
7. Go Program to Calculate the Employee Salary
8. Go Program to find Factorial of a Number
9. Go Program to check Even or Odd
10. Go Program to print Even Numbers from 1 to N
11. Add Two Arrays
12. Arithmetic Operations on an Array