Academic Regulations

Program structure & Detailed Syllabus

2019

For
Under Graduate Programme (B.Tech)

COMPUTER SCIENCE AND ENGINEERING
(Applicable For Batches Admitted From 2019 – 2020)

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY
(AUTONOMOUS)

DUVVADA - VISAKHAPATNAM – 530 049

(An Autonomous Institute, Accredited by NAAC, Affiliated to JNTUK, Kakinada, AP)

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY

(AUTONOMOUS)

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ACADEMIC REGULATIONS

(VR 19)

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY (AUTONOMOUS)

VISAKHAPATNAM

ACADEMIC REGULATIONS for B. Tech. (Regular)

(Applicable for the batches admitted from 2019-20)

The Admission of students into B.Tech. program shall be as per 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 the award of a degree, regular candidate has to register for 160 credits and shall secure 160 credits.
c. For lateral entry scheme admission: A program of study for not less than three academic years and not more than six academic years. Candidate has to register for 120 credits and shall secure 120 credits.

2. Programs of Study

The following programs of study are offered at present for specialization in the B. Tech. Program.

Program Code	Program & Abbreviation
01	Civil Engineering (CE)
02	Electrical and Electronics Engineering (EEE)
03	Mechanical Engineering (ME)
04	Electronics and Communication Engineering (ECE)
05	Computer Science and Engineering (CSE)
12	Information Technology (IT)
19	Electronics and Computer Engineering (E.COMP.E)
54	*Artificial Intelligence and Data science (AID)

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

*code will be assigned later

3. Registration
A student shall register for courses in each semester as per the courses offered by the concerned department.

4. Curricular Program

The Curriculum of the four-year B. Tech course has been designed to achieve a healthy balance between theory & laboratory hours, industry experience and to develop technical skills required for a career in the industry or a career in research.

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 and 50 marks for practical course.

ii) For courses involving laboratory with theory as **integrated course**

Theory and practical will be evaluated for 100 and 50 marks respectively

The credits will be awarded only if a student gets 50% marks independently in theory part as well as practical part

For theory course (including all types of electives), the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End Examinations.

5.1. 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 examination shall be conducted for 30 marks.

5.1.2. **Constitution of India** course will be totally internal evaluation

5.1.3. **Extra-Curricular Activities, sports & games:** Though this course has no credits, it is mandatory to satisfy minimum attendance of 80%.

5.2. Mini project–I (Societal relevant project): 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 for 20 marks   ii)   External assessment for 30 marks

5.3. Mini project-II: It is carried out during the third year. The students have an option to choose their own area of interest which may be related to the course work. Evaluation procedure is same as Mini project-I.

5.4. Main Project/Internship

Main project/Internship shall be carried out in the IV-year and evaluated for 200 marks.

Internship is to create a platform for a job or further research in the chosen area. Eligible students based on merit may opt for a full semester Internship during the fourth year in the industry of same discipline.

5.5. MOOCs: A massive open online course (MOOC) is an online course aimed at large-scale

interactive participation and open access via the web. In addition to traditional course materials such as videos, readings, and problem sets, MOOCs provide interactive user forums that help build a community for the students, professors, and teaching assistants (TAs). MOOCs are a recent development in distance education. Up to 40% of credits per semester as per recent UGC circular in the curriculum may be taken as MOOC course. 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

<div align="center">(Or)</div>

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 when offered. If the same course is not available an alternate course decided by department level committee may be registered and successfully passed. The internal marks secured earlier are 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.

5.6. Technical seminar: Technical seminar is carried out during the Thirdyear. For Technical seminar, the student shall present on an emerging/specialized topic and prepare a technical report, showing his understanding over the topic, and submit to the department, which shall be evaluated through presentation by the Departmental Committee consisting of Head of the Department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for seminar.

5.7. Audit courses: List of audit courses will be notified from time to time. An indicative list of the courses is as shown below.
i) Environmental science, ii) Constitution of India, iii) Extra-curricular activities, sports & games, iv) Professional ethics & Human values

All audit courses will be "Pass/Fail" courses with no specific credit point allotted. The result of the student in the audit course will be notified in the marks memo. A student must pass all the audit courses registered to be eligible for the award of B.Tech. degree.
Note: Audit course will be totally internal evaluation (paper setting as well as valuation will be done by internal expert). Mid and End semester examinations shall be conducted for all Audit courses. It is mandatory to pass all Audit Courses**.**

6. Attendance Requirements:

Aggregate 75% of the attendance is required for promotion to next 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 Monitoring Committee shall review the situation and take appropriate decision.

Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee based on genuine medical grounds. *This privilege is given only three times for regular student and only two times for lateral entry student during the entire program of study*.

A stipulated fee shall be payable towards condonation of shortage of attendance.

Shortage of attendance may be considered for the students who participate in sports at National/International level, co and extra-curricular activities if their attendance is in the minimum prescribed limit.

Note-1: Special cases for students having extraordinary performance at National and International level will be considered by the Academic monitoring committee.

Note -2: Shortage of Attendance below 65% in aggregate shall not be considered for promotion.

7. Academic Requirements:

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

For all courses**,** 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.

Note: For courses where there is no internal evaluation or no external evaluation, pass mark is 50%.

8. Promotion Policy

For Regular Students:

   i.   For promotion to II Year from I Year, a student has to secure minimum 50% of total credits in the I year courses.
  ii.   For promotion to III Year from II Year, a student has to secure minimum 50% of total credits in the II Year courses.
 iii.   For promotion to IV Year from III Year, a student has to secure minimum 50% of total credits in the III Year.

For Lateral Entry Students:

   i.   For promotion to III Year from II Year, a student has to secure minimum 50% of total credits from II Year courses.
  ii.   For promotion to IV Year from III Year, a student has to secure minimum 50% of total credits in the III Year.

9. Supplementary examinations: Supplementary examinations for the odd Semester shall be conducted with the regular examinations of even semester and vice versa.
In case of failure in any course, a student may be permitted to register for the same course when offered.

In case of integrated courses, student has to reappear for failed part only (Theory part/Laboratory part), but credits will be awarded only after both parts are successfully completed.

Advance supplementary examination shall be conducted for IV Year, I semester courses during the study of IV Year, II semester.

Note: Instant Supplementary Examination will be conducted for one course from IV B. Tech- II Semester courses at the end of the program after declaration of results.

10. Grading System and award of class

10.1. 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
		Absent	-1
		Withheld	-2
		Malpractice	-3

Computation of SGPA

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

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

SGPA (Si) = Σ (Ci x Gi) / ΣCi

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

Computation of CGPA

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

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

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

- Equivalent Percentage = (CGPA – 0.75) X 10

10.2. Award of Class

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

Class Awarded	CGPA to be secured	From the CGPA secured from 160 Credits.
First Class with Distinction	≥ 7.75 without course failures during entire duration of study	
First Class	≥ 6.75 to<7.75	
Second Class	≥ 5.75 to < 6.75	

11. General Instructions

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

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

iii. In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman, Academic Council is final.

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

12. 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

13. Transitory Regulations: If a student is detained and has to get Re-admitted and follow the same regulation of year of admission.

Transfer cases:

- Transfer from other institutions is permitted as up to II Yr Second semester.
- A committee will be constituted for mapping the courses and credits.
- Student should not have any backlogs at the time of applying.

14. 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.

15. Withholding of Results

If the student has not paid the fee 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.

16. Malpractices Rules

DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

S.No	Nature of Malpractices/ Improper conduct	Punishment
1 (a)	If the candidate possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the course of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course only.
(b)	If the candidate gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate 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	The candidate who has impersonated shall be expelled from examination hall. The

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

	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.	
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.	

17. UGC RECOMMENDED PUNISHMENT FOR RAGGING

   i.   Suspension from attending classes and academic privileges
   ii. Withholding/withdrawing scholarships/fellowship and other benefits.
   iii. Debarring from appearing in any test/examination or other evaluation process
   iv. Withholding results
   v.   Debarring from representing the institution in any regional, national or international meet, tournament, youth festival etc.
   vi. Suspension/expulsion from the hostel
   vii. Cancellation of admission
   viii. Rustication from the institution for period ranging from 1 to 4 semesters.
   ix. Expulsion from the institution and consequent debarring from admission to any other institution for a specified period.
   x.   Fine may extend up to Rs. 2.5 lakh.

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VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY: VISAKHAPATNAM

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

PROGRAM STRUCTURE (VR-19)

I Year- I Semester

S. No	Course Code	Name of the Course	L	T	P	Credits
1.	1000191100	Mathematics-I	3	1*	0	3
2.	1000191123	Applied Chemistry	3	1*	3	4.5
3.	1003191101	Engineering Drawing	1	0	4	3
4.	1000191121	Technical English Communication	2	0	3	3.5
5.	1005191120	Problem Solving & Programming using C	3	1*	3	4.5
6.	1000191110	Engineering Exploration	0	0	4	2
7.	1000191131	Extra Curricular Activities, Sports and Games	0	0	4	0
Total Credits :						**20.5**

I Year – II Semester

S. No	Course Code	Name of the Course	L	T	P	Credits
1.	1000191202	Probability and Statistics	3	1*	0	3
2.	1000191221	Applied Physics	3	1*	3	4.5
3.	1005191222	OOPS through C++	3	1*	3	4.5
4.	1004191200	Basic Electronics	3	0	0	3
5.	1000191101	Mathematics-II	3	1*	0	3
6.	1005191210	IT Workshop	0	0	3	1.5
7.	1000191130	Constitution of India	2	0	0	0
Total Credits :						**19.5**

Total Credits =20.5 + 19.5 = 40

II Year- I Semester

S.No	Course Code	Name of the Course	L	T	P	Credits
1	1005192100	Discrete Mathematical Structures	3	1*	0	3
2	1005192101	Digital Logic Design	3	1*	0	3
3	1005192120	Data structures through c	3	1*	3	4.5
4	1005192121	Java Programming	3	0	3	4.5
5	1099192100	Managerial Economics And Financial Analysis	3	0	0	3
6	1020192100-1020192102	Open Elective-I	3	0	0	3
7	1005192170	Mini project-I(EPICS/Societal Relevant Project)	0	0	2	1
8	1000192130	Environmental Science	2	0	0	0
Total Credits :						**22**

II Year- II Semester

S.No	Course Code	Name of the Course	L	T	P	Credits
1	1005192220	Advanced Data structures	3	0	3	4.5
2	1005192200	Computer Organization and Architecture	3	1*	0	3
3	1005192221	Database Management Systems	3	0	3	4.5
4	1005192202	Formal Languages and Automata Theory	3	1*	0	3
5	1005192201	Software Engineering	3	0	0	3
6	1000192110	Communication Skills Lab	0	0	2	1
Total Credits :						**19**

Open Elective-I		
S. No.	**Course Code**	**Course Title**
1	1020192100	Employability Readiness Program-I
2	1020192101	Public Administration
3	1020192102	Foreign Linguistic - French

III Year   **I Semester**

S. No.	Course Code	Course Title	L	T	P	C
1	1005193120	Web Technologies	3	0	3	4.5
2	1005193100	Design and Analysis of Algorithms	3	0	0	3
3	1005193101	Data Warehousing and Data Mining	3	0	0	3
4	1005193102	Operating Systems	3	0	0	3
5	**Professional Elective-I**		3	0	0	3
	1005193150	a) Programming Essentials in Python				
	1005193151	b) Industrial Oriented Python Programming				
	1005193152	c) Unix and Shell Programming				
	1005193153	d) Computer Graphics				
	1005193154	e) Advanced Computer Architecture				
6	**Open Elective-II**		3	0	0	3
	1001193160	a)Industrial Waste Water Engineering				
	1002193160	b) Solar Photovoltaic Energy				
	1002192201	c) Power Generation				
	1003193160	d) Industrial Robotics				
	1003193161	e) Green Engineering Systems				
	1003193162	f) Mechatronics				
	1003193163	g) Operations Research				
	1004193160	h) Data Communications				
	1004193161	i) Signal Processing				
7	1005193110	Python Programming Lab	0	0	3	1.5
8	1099193130	Professional Ethics & Human Values	2	0	0	0
Total Credits						**21**

Program Structure

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Detailed Syllabus

I Year- I Semester

S. No	Course Code	Name of the Course	L	T	P	Credits
1.	1000191202	Probability and Statistics	3	1*	0	3
2.	1000191221	Applied Physics	3	1*	3	4.5
3.	1005191222	OOPS through C++	3	1*	3	4.5
4.	1004191200	Basic Electronics	3	0	0	3
5.	1000191101	Mathematics-II	3	1*	0	3
6.	1005191210	IT Workshop	0	0	3	1.5
7.	1000191130	Constitution of India	2	0	0	0
Total Credits :						**19.5**

Course Code		**L**	**T**	**P**	**Credits**
1000191100	**MATHEMATICS – I**	**3**	**1**	**0**	**3**

Course Overview:

This course deals with differential equations and its application with more focus on Engineering Mathematics. This course helps the students to learn relevant mathematical tools which are required in the analysis of problems in engineering and scientific professions. Topics included in this course are functions of two variables, higher order linear differential equations, Laplace Transforms, Inverse Laplace transforms, Partial differential equations of first order.

Course Objectives:

1. Utilize mean value theorems to find the characteristics of the function and acquire the knowledge maxima and minima of functions of two variables.
2. To discuss higher order differential equations.
3. To discuss Laplace Transform and its properties.
4. To apply Inverse Laplace transform to different types of functions and to solving initial value problems.
5. To solve first order partial differential equations by analytical methods.

Course Outcomes: The student will be able

	Course outcome	**Level as per Bloom's Taxonomy**	**PO number mapped**
CO1	To understand the mean value theorems and evaluate maxima and minima of functions of two variables without constraints.	L2, L4	PO1 PO2
CO2	To understand different analytical methods to solve higher order linear differential equations.	L2, L3	PO1 PO2
CO3	To understand Laplace transform technique to solve initial and boundary value problems arising in engineering stream.	L2, L3	PO1 PO2
CO4	To understand solution of first order linear partial differential equations.	L2, L3	PO1 PO2

UNIT- I   **L: 08**

Mean Value Theorems: Rolle's Theorem – Lagrange's Mean Value Theorem – Cauchy's Mean value Theorem. Functions of several variables – Jacobian – Functional dependence – Maxima and

Minima of functions of two variables without constraints.

Outcome: The student is able to find stationary point of a curve and extreme values of a given function.

Activity/Event: Finding Extreme value of functions of two variables.

UNIT-II   L: 08

Linear Differential Equations of Higher Order: Non-homogeneous linear differential equations of second and higher order with constant coefficients with non-homogeneous terms of the type e^{ax}, sin ax, cos ax, x^k, method of variation of parameters.

Outcome: The student will be able to solve higher order linear differential equations with constant coefficients.

Activity/Event: Finding current in LCR circuits.

UNIT-III   L: 08

Laplace Transforms: Introduction - Laplace transforms of standard functions – Shifting Theorems - Transforms of derivatives and integrals - multiplication by t^n - division by t – Unit step function, Unit impulse function.

Outcome: The student will be able to Understand Laplace transform of standard functions.

Activity/Event: Seminar by student

UNIT-IV   L: 08

Inverse Laplace Transforms: Introduction - Properties – Inverse Laplace by using partial fractions and Convolution theorem (without proof)-solving initial and boundary value problems by using Laplace Transform.

Outcome: The student is able to apply Inverse Laplace transform of standard functions.

Activity/Event: The student will be able to apply Inverse Laplace transform technique to solve differential equations with given initial conditions.

UNIT-V: L: 08

Partial Differential Equations of first order: Solutions of first order linear (Lagrange) equation and nonlinear (standard type $f(p, q) = 0, f(z, p, q) = 0, f(x, p) = g(y, q)$ & $claurits$) equations.

Outcome: Student is able to solve first order partial differential equation by different analytical methods.

Activity/Event: Modeling the linear first order PDE and solving.

Text Books:

1. Higher Engineering Mathematics by H.K. Dass, S.Chand Publications.
2. Higher Engineering Mathematics 2e, B. V. Ramana, TataMcGrawHill Publishing Co. Ltd.

Reference Books:

1. Engineering Mathematics, Greenburg, 2nd Ed, Pearson education.
2. Higher Engineering Mathematics – 43rd Edition by Dr. B. S. Grewal, Khanna Publishers, New Delhi.
3. A Text book of Engineering Mathematics, N.P.Bali, Laxmi Publications (P) Ltd.
4. Advanced Engineering Mathematics, Erwin Kreszig, 8thEd, Wiley Student Edition.

Course Code	APPLIED CHEMISTRY	L	T	P	Credits
1000191123		3	1	3	4.5

Course Overview:

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Course Objectives:

- **Importance** of usage of plastics in household appliances and automotive industries.

- **Outline** the basics for the construction of electrochemical cells, batteries and fuel cells.

- **Understand** the mechanism of corrosion and how it can be prevented.

- **Express** the increase in demand as wide variety of advanced materials are introduced which have excellent engineering properties.

- **Explain** the structures, bonding and shapes of various octahedral complexes.

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Identification of different polymers and their functionalities	Level-2	PO1,PO2, PO10
CO2	Recognize the different types of electrochemical cells and its applications	Level-3	PO1, PO2
CO3	Analysis of corrosive environments and protection of precious metal	Level-3	PO1, PO2, PO9
CO4	Adoption of different green methodologies and acquire knowledge on different advanced materials	Level-4	PO1, PO2, PO9

UNIT- I

Polymer Chemistry:

Introduction to polymers, Classification of polymers, Types of Polymerization (Addition, Condensation & copolymerization) with examples, properties of polymers (physical and mechanical).
Plastics - Thermoplastics and Thermosetting plastics, compounding of plastics, Moulding Techniques (Compression & Blow moulding), Preparation, properties and applications of – PVC and Bakelite.

Outcome: After the completion of Unit I, the student will be able to
- Explain the different types of polymers and their applications.
- Explain the preparation, properties and applications of Bakelite & PVC.

Activity:

➢ Identification and collection of various thermo and thermosetting plastics.

Experiments:

1. Preparation of a polymer (phenol-formaldehyde resin)

UNIT II:

Structure and Bonding Models:

Molecular orbital theory – bonding in homo and hetero nuclear diatomic molecules – energy level diagrams of H_2, C_2, N_2, O_2 and CO, etc. calculation of bond order, shapes of d orbitals, crystal field theory – salient features – Crystal field splitting in octahedral environments, Crystal field stabilization Energy(CFSE) for high spin and low spin octahedral complexes.

Outcome: After the completion of Unit II, the student will be able to
- Illustrate the molecular orbital energy level diagram of different molecular species
- Calculate the bond orders of different molecules.
- Calculate CFSE for different complexes.

Activity:

➢ Calculation of CFSE for different Complexes (Virtual lab).

Experiments:

1. Determination of Copper by using standard EDTA solution.
2. Determination of Iron (II) by using standard $KMnO_4$ solution.

Unit-III:

Electrochemistry and Applications:
Construction and working of Galvanic cell, Electrode potential, Reference electrodes - Standard hydrogen electrode, Electrochemical series & its applications, p^H meter and applications (acid-base titrations), concept of conductivity - conductometric titrations (acid-base titrations)

Batteries: Primary cell – Dry cell (Leclanche cell) and applications, Secondary cells – lead acid battery & applications.

Outcome: After the completion of Unit III, the student will be able to
- Differentiate between p^Hmetry and conductometric titrations
- Explain the construction of batteries and their applications.

Activity:
  ➢ Identification and collection of various types of batteries.

Experiments:
  1. p^Hmetric titrations of (i) strong acid vs. strong base.
  2. Conductometric titrations - (i) strong acid vs. strong base.
  3. Construction & working of Galvanic cell (Virtual lab).
  4. Determination of strength of an acid in Pb-Acid battery.

Unit-IV:

Corrosion:

Introduction to corrosion, dry corrosion with mechanism, electrochemical theory of corrosion with mechanism.
Types of Electrochemical corrosion (differential aeration corrosion, galvanic corrosion, pitting corrosion & stress corrosion), protection – cathodic protection, corrosion inhibitors, Cathodic& Anodic coatings, Galvanizing & Tinning.

Outcome: After the completion of Unit IV, the student will be able to
  • Discuss different types of protecting methods of metals.
  • Demonstrate the corrosion prevention methods.

Activity:

  ➢ Collection of various types of corrosive & non corrosive products.

Experiments:
  1. Determination of Iron (II) by using standard $K_2Cr_2O_7$ solution.
  2. Determination of Zinc (II) by ferrocyanide method.

Unit-V:

Chemistry of Advanced engineering materials:
Nanomaterials: Introduction - Carbon nanotubes: Types, preparation (Electric Arc discharge, Laser ablation and CVD techniques), properties and applications, Fullerenes – structure and applications.
Composites - Fiber reinforced materials – CFRP & GFRP
 Biodegradable polymers and its applications
Green Chemistry: 12 Principles only

Outcome: After the completion of Unit V, the student will be able to
  • Explain the different types of Nanomaterials and their applications.
  • Apply the principles of polymers in reinforced materials like CFRP & GFRP.
  • Acquire knowledge of advanced materials and their applications.

Activity:

  ➢ Implementation of any one green principle

Experiments:

1. Preparation of nano materials.

Text Books:

1. Engineering Chemistry by Jain and Jain; DhanpatRaiPublicating Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015 edition.

Reference Books:

1. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition (second).
2. Engineering Chemistry by PrasanthRath, Cengage Learning, 2015 edition.
3. A text book of engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition
4. Applied Chemistry by H.D. Gesser, Springer Publishers
5. Text book of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others, University Press, IIM

Applied Chemistry - Laboratory

Course objectives:

The student with the knowledge of the basic chemistry will understand and explain scientifically the various chemistry related problems in the industry/engineering and develop experimental skills for building technical competence. The student will be able to understand the new developments and breakthroughs efficiently in engineering and technology. The introduction of the latest (R&D oriented) topics will make the engineering student upgraded with new technologies.

List of Experiments:

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

1. Determination of Hardness of a groundwater sample**.**
2. Determination of alkalinity of Water.
3. Determination Copper using standard EDTA solution.
4. Determination of Zinc (II) by ferrocyanide method.
5. Determination of Iron (II) by using standard $KMnO_4$ solution.
6. Determination of the Concentration of HCl using Sodium Hydroxide (by pH - metry method).
7. Determination of the Concentration of strong acid vs strong base (by conductometric method)
8. Determination of Iron (II) by using standard $K_2Cr_2O_7$ solution.
9. Preparation of a polymer (phenol-formaldehyde resin).
10. Preparation of Nano materials (Demonstration only)
11. Construction of Galvanic cell (Virtual lab).
12. Determination of strength of an acid in Pb-Acid battery.

*Of the above experiments at-least 10 assessment experiments should be completed in a semester.

Course outcomes:

After the completion of the course the student will be able to:

CO1: Analyze & generate experimental skills.
CO2: Enhance the thinking capabilities in the modern trends of engineering & technology.
CO3: learn and apply basic techniques used in chemistry laboratory for preparation of Organic Compounds.
CO4: Learn safety rules in the practice of laboratory investigation.

Course Code	ENGINEERING DRAWING	L	T	P	Credits
1003191101		1	0	4	3

Course Overview:

This course deals with the principle method of communication for engineers, the objective to introduce the students, the techniques of constructing the various types of polygons, curves. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

Course Objectives:

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

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO number mapped
CO1	Understand the use of drawing instruments to construct the polygons and curves	Understanding	PO1,PO2,PO3
CO2	Learn the principle of orthographic projections. Draw Orthographic projections of points, lines.	Analyzing	PO1,PO2,PO3,PO12
CO3	Draw the various types of planes and solids its views in different Positions	Analyzing	PO1,PO2,PO3,PO12
CO4	Draw isometric views of simple objects	Analyzing	PO1,PO2,PO3,PO12

Unit-I: **No. of lecture hours: 13**

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

Outcome :

The students able to learn the use of drawing instruments to construct the polygons, curves and various types of scales.
To enlarge or reduce the size of objects in representing them.

Activity/Event :

Demonstration of Ellipse,Parabola , Hyperbola & polygons.

Unit-II: **No. of lecture hours: 13**

Introduction to orthographic projections: Projections of points - Projections of straight lines: Line parallel to one plane and perpendicular to other plane, parallel to both the planes; projections of straight lines – parallel to one plane and inclined to the other plane. Straight lines inclined to both the planes.

Outcome:

At the end of the unit, the student should be able to
The students able to learn the principle of orthographic projections.
Draw the projections of the lines inclined to both the planes H.P & V.P.

Activity/Event :

Demonstration of straight lines and its views.

UNIT III :   **No.of lecture hours: 13**

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

Outcome:

At the end of the unit, the student should be able to
Draw the various types of planes and its views in different Positions .

Activity/Event :

Demonstration of Pentagon ,Hexagon, Heptagon& octagon.

Unit-IV: **No.of lecture hours: 13**

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

Outcome:

At the end of the unit, the student should be able to...
 Draw the various types of solids and its views in different Positions .

Activity/Event :
Demonstration of cylinder, cone , prism & pyramids.

Unit-V: **No. of lecture hours: 13**

Conversion of isometric views to orthographic views.
Conversion of orthographic views to isometric views.

Outcome:

At the end of the unit, the student should be able to Draw 3D view through isometric views & 2D view through orthographic views.

Activity/Event :

Demonstration of Isometric objects & views of the Isometric objects.
Demonstration of Auto CAD software & drawing & editing basic figures.

Text Books:

1. Engineering Drawing, N. D. Butt, Chariot Publications.
2. Engineering Drawing, K. L. Narayana& P. Kannaiah, Scitech Publishers.

Reference Books:

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

Course Code	**TECHNICAL ENGLISH COMMUNICATION**	L	T	P	Credits
1000191121		2	0	3	3.5

Course Overview:

In this course students will read, analyze, and interpret material from general and technical fields, and will practice reading, writing, listening and speaking skills on a variety of contemporary topics.

Course Objectives:

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

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO number mapped
CO1	The students will be able to read, understand and interpret material on Environment, Science and Technology, tourism, Energy Sources, Social Awareness	Understanding (L2) and Applying (L3)	PO7, PO10, PO6, PO12
CO2	The students will be able to analyze the functions of language and grammar in spoken and writtenforms.	Applying (L3) and Analyzing (L4)	PO10, PO12, PO5
CO3	The students will be able to write effectively on variousdomains.	Applying (L3) andCreating (L5)	PO10, PO12
CO4	The students will be able to prepare and exhibit oralpresentation skills by using ICT.(Individual/Team)	Applying (L3) and Creating (L5)	PO10, PO12, PO9, PO5

UNIT- I   **No. of lecture hours: (T+L)7+4 =11**

Reading:1) How to Regain Green Cover 2) Solution to Plastic Pollution

Writing: Functional grammar [articles, prepositions of time, place, direction and movement, verb-tense, subject-verb agreement]

Listening: TED Talk on Water Harvesting (LC) –Answering comprehension based Qs ~ Listening to improve pronunciation

Speaking: Functional English(LC) ~ Introducing oneself

Outcomes: The student will be able to :

read, understand and interpret material on Environment.

speak about himself/herself.

listen to an audio and take notes from the audio clip.

Activities: Reading Comprehension- Note making while reading 1&2

Letter Writing

Experiments:

1**.** Just A Minute –Tell about oneself

2. Note taking while listening to the TED talk

3. Interactions

UNIT-II   **No. of lecture hours: : (T+L) 6+4=10**

Reading Texts: 1) The Hubble Telescope 2) Genesis of ISRO

Writing: Writing formal letters ~ Functional grammar ~Modals - Paraphrasing

Listening: Listening to a debate on " Colonizing the Moon" (LC) ~ Note Taking

Speaking: (LC) Making mini presentations on general topics

Outcomes: The student will be able to:

read, understand and interpret material on Space Technology

analyze the functions of language and grammar in spoken and written forms

write formal letters and paraphrase the text.

prepare and exhibit oral presentation skills by using ICT(Individual/team)

Activities:
- Reading Comprehension
- Letter Writing-Formal

Experiments:

1. Making a mini presentation

Unit-III: **No. of lecture hours: : (T+L)8+4=12**

Reading Texts: 1) Southern Splendour 2) Tourism in India: Role in Conflict and Peace

Writing: Paragraph writing ~ Functional grammar [relative pronouns, comparative adjectives, adverbs]

Listening: (LC) Listening comprehension ~ Listening for global meaning ~ Listening for getting at the nuances and the mood of the speaker

Speaking: (LC) Telephonic Skills ~ participating in an interactive video and teleconferencing

Outcome: The students will be able to :

read, understand and interpret material on Travel.

write Paragraph and Essays with proper coherence.

pronounce the words with apt pronunciation

maintain proper telephonic etiquette.

Activities:

Reading Comprehension

Paragraph writing

Essay writing

Experiments:

1. Letters and Sounds- Some pronouncing Patterns
2. Telephonic Skills

Unit-IV: **No. of lecture hours: : (T+L) 7+4=11**

Reading Texts: 1) Wind Energy 2) How pertinent is the nuclear option

Writing: Writing a formal E-mail

Speaking: Group Discussion (LC)

Listening: Listening to an Interview (LC) related to the text ~ listening critically for understanding the attitude/tone of the speaker

Outcome: The students will be able to:

read, understand and interpret material on Energy Sources.

 write formal Email.

participate in Group Discussion without hesitation.

Activities:

Reading Comprehension

Email Writing

Experiments:

1. Group Discussion
2. Mock-Interview

Unit-V: **No. of lecture hours: : (T+L) 8+4=12**

Reading Texts: 1) The Evolution of Media
2) The Top Ten Developments in Journalism in the 2000s

Writing: Interpret graphic tools [tables, pie & bar charts ~ writing an abstract ~ Leveraging ICT for communication ~ Preparing a PPT(LC)

Speaking: Making short presentations [individual/team] with the aid of PPT

Listening: Listening to Situation/Scene ~ Sub skills: Listening to understand one's viewpoint ~Listening to understand speaker's intention ~Listening for local understanding.

Outcome: The students will be able to:
read, understand and interpret material on Media.
interpret graphical data
  present PPT without hesitation.
  listen to a situation and respond

Activity:
Information Transfer

Experiment:
Oral Presentation

Suggested Books:
- Elango, K et.al 2014. Mindscapes: English for Technologists and Engineers, Orient Blackswan, Hyderabad.

Reference Books:
- Balasubrmanyam M. 1985. Business Communication. Vani Educational Books, New Delhi
- Balasubramanian T. 1989. A Text book of Phonetics for Indian Students. Orient Longman, New Delhi.
- Krishnaswamy, N and Sriraman, T. 1995. Current English for Colleges. Macmillan India Ltd. Madras.
- Mohan Krishna and Meera Banerjee. 1990. Developing Communication Skills. Macmillan India Ltd.New Delhi.
- Narayanaswamy V R. 1979. Strengthen your Writing. Orient Longman, New Delhi.
  Naterop, Jean, B. and Rod Revell. 1997. Telephoning in English. Cambridge University Press, Cambridge

Course Code	PROBLEM SOLVING AND PROGRAMMING USING C	L	T	P	Credits
1005191120		3	1*	3	4.5

Course Overview:

C is a basic building block for every language. It is a general Purpose Language. To develop the programming skills 'C' is the only platform to develop programming techniques for any type languages.

Programming is an increasingly important skill, whether you aspire to a career in software development, or in other fields. This is because programming is fundamentally about figuring out how to solve a class of problems and writing the algorithm, a clear set of steps to solve any problem in its class. This course will introduce you to a powerful problem-solving process. In this course, you will learn how to develop an algorithm, and then progress to reading code and understanding how programming concepts relate to algorithms.

Course Objectives:

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

Course Outcomes:

	Course outcome	**Skill**	**PO**
CO1	Write compile and debug Programs in C language	Understand	PO1,PO2, PO3
CO2	Use operators, data types and write programs	Understand	PO1,PO2
CO3	Select the best loop construct for a given problem	Analyzing	PO3,PO5
CO4	Design and implement C programs	Analyzing	PO1,PO2 PO3,PO4, PO12

Unit-I: **L-6   T-1**

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.

Outcome:
- ✓ Illustrate flowchart and algorithm to the given Problem.
- ✓ Outline the Basic Structure of Computer.

✓ Explain the Structure of C Program

Activity/Event:
Design a flow chart and develop an algorithm for a real time application.

Unit-II: L-10   T-3

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.

Outcome:
      ✓ Explain basic Structure of the C-PROGRAMMING, declaration and usage of variables.
      ✓ Build C programs using operators and control structures.

Activity/Event:
  ✓ Build a C Program which has Linear Solution.

Unit-III: L-8   T-1

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.

Outcome:
  ✓ Build C programs to access arrays, strings and functions.
  ✓ Compare Array and Strings.
  ✓ Understand & Applying Various Library Functions

Activity/Event:
  ✓ Build a pre-processor directive for strings

Unit-IV: L-7   T-1

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.

Outcome:
      ✓ Explain modular Programming
      ✓ Identify Categories of Functions.

Activity/Event:

Simulate how function calls are handled in turbo c with a suitable example using structure chart

Unit-V: **L-9   T-2**

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.

Outcome:
- ✓ Explain the Concept of Dynamic memory allocation
- ✓ Develop C programs using pointers
- ✓ Outline basic concepts on files

Activity/Event :

    Create array of structure dynamically for real-time application

Text Books:
- ➢ Programming in C, ReemaThareja, and Oxford.
- ➢ The C programming Language, Brain W.kernighan, Dennis Ritchie,2e,pearson
- ➢ C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage. Pub.
  Programming with C, Bichkar, Universities Press.

Reference Books:
- ➢ ANSIC Programming garyJ.Bronson. Cengage learning.
- ➢ Let us 'C' by yashwantkanethkar, BPB Publications, 16 edition.

PROBLEM SOLVING AND PROGRAMMING USING C LAB

1. 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

2. 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.

3. 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

4. a) Write a C Program to Find Whether the Given Number is

    i)Strong number ii)perfect number

    b) Write a C Program to print the following between 1 to n

    i)Prime Number ii) Armstrong Number

5. Demonstration of arrays& Strings

    a) Write a C program to perform Linear Search

    b) Write a C program to perform transpose of two matrices

    c) Write a C program to perform multiplication of two matrices

    d) Implementation of string manipulation operations with and **without** libraryfunction.

    i)copy ii) concatenate iii)length iv)compare

6. a) Write a C program to find cube of any number using function.

    b) Write a c program to find area and volume of geometric shapes using functions.

    c) Write a C program to check whether a number is even or odd using functions.

7. 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

8. a) Write a C Program to Access Elements of an Array UsingPointer

    b) Write a C Program to find the sum of numbers with arrays andpointers.

    c)Write a c program to illustrate parameter passing techniques

9. a)Write a C Program to Store Information of a student UsingStructures

    b) Write a C program to create memory for int, char and float variable at run time.

10 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

Course Code	Engineering Exploration	L	T	P	Credits
1000191110		0	0	4	2

Course Overview:

This course aims in teaching the Inter disciplinary engineering knowledge to students with the help of activity-based learning. This course teaches "Engineering Design, Mechanisms, Platform based development & Data acquisition and analysis" concepts to cover the basic knowledge & practices of multiple engineering disciplines.

Course Objectives:

To understand the importance of multi-disciplinary Engineering knowledge in the current world, for making any project. To learn Engineering design process for creating any new product/system. To learn the fundamental practical knowledge for starting any inter-disciplinary project.

	Course Outcome	Cognitive Level as per Bloom's Taxonomy	PO number mapped
CO1	Realize the purpose/Role of Engineer for solving social problems	Understand (Level 1)	PO6, PO7, PO8, PO9, PO12
CO2	Learn to Design a component/system in an engineering way	Apply and Analyze (Level 2 & 3)	PO1, PO3, PO5, PO9
CO3	Learn to use mechanisms, Arduino, sensors,motors.	Understand (Level 1)	PO1, PO3, PO5, PO9
CO4	Integrating different systems (mechanical/Electrical/computer) to work as a unit	Apply and Analyze and Create (Level 3, 4 & 5)	PO2, PO3, PO5, PO9

Unit-I: **No.of lecture hours: 6**

Introduction to Engineering and Engineering Study: Introduction to Engineering, Difference between science and engineering, scientist and engineer, needs and wants various disciplines of engineering, some misconceptions of engineering, Role of engineers in solving social problems, Graduate Attributes.

Outcome: Student will learn about Engineering & it's evolution in solving social problems. Will also learn about Variety of engineering branches and their contributions to society.

Activity theme: Activities aimed to understand Engineering

Activities: (only for integrated theory and lab course)

1**.** Identifying Various Engineering disciplines involved in a project/system

2. Listing down various social problems in the world & Finding how engineering can solve the social problems.

Unit-II: **No. of lecture hours: 12**

Engineering Design: Engineering Design Process, Multidisciplinary facet of design, Generation of multiple solution, Introduction to Mechatronics systems, Motor and Battery Sizing concepts, Introduction to PCB design.

Outcome: Student will be able to understand the Engineering Design procedure & applying the same knowledge for making / creating a new product/model.

Activity theme: Activities based on the designing & making of models

Activities: (only for integrated theory and lab course)

1. Converting 230V of AC to 5V of DC power.

2. Making of a Bridge Structure.

3. Preparing a Full Adder circuit using IC's

4. Creating a mobile App using MIT app inventor

Unit-III: **No.of lecture hours: 6**

Mechanisms: Basic Components of a Mechanism, Degrees of Freedom (Mobility of a Mechanism), 4 Bar Chain, Crank Rocker Mechanism, Slider Crank Mechanism.

Outcome: Student will be able to understand the importance & working of mechanisms.

Activity theme: Creating a model which illustrate any mechanism

Activities: (only for integrated theory and lab course)

1. Determining the Degree of Freedom for a given structure

2. Assembling of Scissor jack mechanism

Unit-IV: **No.of lecture hours: 8**

Platform based development: Introduction to platform-based development (Arduino) programming and its essentials, Introduction to sensors, transducers and actuators and its interfacing with Arduino.

Outcome: Student will be able to gain knowledge about the various sensors, transducers, actuators &Arduino device. To Program Arduino for any inter-disciplinary project.

Activity theme: To Program to control lights, Motors, Sensors etc., on Arduino platform.

Activities: (only for integrated theory and lab course)

1. Obstacle detection using IR sensor on Arduino Platform

2. Measuring distance using Ultrasonic sensor on the Arduino Platform
3. Measuring Temperature and Humidity using DHT sensor on Arduino Platform

Unit-V: **No. of lecture hours: 8**

Data Acquisition and Analysis: Types of Data, Descriptive Statistics techniques as applicable to different types of data, Types of graphs as applicable to different types of data, Usage of Microsoft Excel tool for descriptive statistics, Data Acquisition using Sensors interfaced with Arduino, exporting acquired data to Microsoft Excel and analysis using visual representation.

Outcome: Student will be able to understand the importance of data collection & analysis. Able to use various sensors with Arduino, acquires data from sensors and analyzing the data through a computer

Activity theme: Acquiring data from sensors using Arduino

Activities: (only for integrated theory and lab course)

1. Data Analysis through Arduino programming for multiple sensors

Course Code	Extra Curricular Activities, Sports and	L	T	P	Credits

| 1000191131 | **Games(Audit course)** | 0 | 0 | 4 | 0 |

Extra-Curricular Activities, sports & games: Though this course has no credits, it is mandatory to satisfy minimum attendance of 80%.

I Year- II Semester

S. No	Course Code	Name of the Course	L	T	P	Credits
1.	1000191202	Probability and Statistics	3	1*	0	3
2.	1000191221	Applied Physics	3	1*	3	4.5
3.	1005191222	OOPS through C++	3	1*	3	4.5
4.	1004191200	Basic Electronics	3	0	0	3
5.	1000191101	Mathematics-II	3	1*	0	3
6.	1005191210	IT Workshop	0	0	3	1.5
7.	1000191130	Constitution of India	2	0	0	0
Total Credits :						**19.5**

Course code	PROBABILITY AND STATISTICS	L	T	P	Credits
1000191202		3	1	3	3

Course Description and Objectives:

This course is designed to equip the students with a working knowledge of probability, statistics, and modeling in the presence of uncertainties. The major objective of the course is to help the students to develop an intuition and an interest for random phenomena, and to introduce both theoretical issues and applications that may be useful in real life. This required course provides the foundation for modern concepts of reliability, system analysis, risk analysis and risk management through applications of mathematical knowledge to probability and statistics.

Course Objectives:
1. To explain fundamental concepts of probability theory and random variables.
2. To develop an understanding of the role of discrete and continuous probability distributions in science and engineering.
3. The basic ideas of statistical methods of studying data samples.
4. To impart statistical methods in various applications Engineering

Course Outcomes:

	Course outcome	Skill	PO
CO1	**Explain** the notion of random variable and **evaluate** the expected value and probability of random variables.	L2 L5	PO-1 PO-2 PO-12
CO2	**Apply** Binomial, Poisson, Normal, gamma and weibull distributions for real data to **compute** probabilities, theoretical frequencies.	L3 L6	PO-1 PO-2 PO-3
CO3	**Evaluate** the confidence levels and maximum error for large and small samples	L5	PO-1 PO-2
CO4	**Apply** the concept of hypothesis testing for large and small samples in real life situations to draw the inferences and estimate the goodness of fit.	L3	PO-1 PO-2 PO-3 PO-4

UNIT-I: RANDOM VARIABLES:

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

Outcome: The student can able to classify the discrete and continuous random variables.

Activity: Finding the average number of outcomes of the random variables.

UNIT-II: DISTRIBUTIONS:

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

Outcome: The student will be able to differentiate the discrete and continuous distributions.

Activity: Finding the different moments of distribution functions.

UNIT-III: SAMPLING DISTRIBUTIONS:

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

Outcome: The student able to evaluate the confidence levels and maximum error.

Activity: Finding the sample size and level of confidence using maximum error.

UNIT-IV: TESTING OF HYPOTHESIS

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

Outcome: The student will be able to formulate the hypothesis and analyze the data.

Activity: Applying statistical analysis to interpret the data.

UNIT-V: CORRELATION & CURVE FITTING

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

Outcome: The student will be able to examine the correlation and forecast the values.

Activity: Finding the regression lines using correlation and least square lines.

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

Reference Books:

1. Fundamentals of Applied Statisitics ;S.C.Gupta&V.K.KapoorS.Chand& Sons, Cengage.
2. Higher Engineering Mathematics, H.K.Dass
3. Higher Engineering Mathematics,, B.V.Ramana

Course code			L	T	P	Credits
1000191221		**APPLIED PHYSICS**	3	1	3	4.5

Course Overview:

The course covers the topics of interference, diffraction and polarization. Further, the concepts of optical fiber, quantum mechanics, free electron theory and semiconductor physics.

Course Objectives:

To introduce the basic concepts of physical optics phenomenon such as interference, diffraction and polarization. Understanding of the concepts found in electromagnetic fields, quantum mechanics, free electron theory, semiconductor physics and provide an insight into band theory of solids.

	Course outcome	Level as per Bloom's Taxonomy	PO number mapped
CO1	Describe the wave phenomenaand apply these concepts for construction of Lasers and optical fibers.	L2 L3	PO-1, PO-2, PO-12
CO2	Apply the knowledge of basic quantum mechanics, to set up one-dimensional Schrodinger's wave equation	L2 L3	PO-1, PO-2, PO-9, PO-12
CO3	Identify the importance of classical and quantum mechanical treatment of materials.	L2 L3	PO-1, PO-2, PO-9, PO-12
CO4	Make use of the basic concepts of energy bands in crystalline solids to understand semiconductor physics.	L2 L3	PO-1, PO-2, PO-9, PO-12

UNIT- I   **L: 08**

INTERFERENCE:

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

Outcome: Student will be able to understand the basic concepts of interference and apply these concepts for understanding the formation of interference pattern in thin films and Newton's rings.

Experiments:

- ➢ Determination of radius of curvature of a plano-convex lens by forming Newton's rings
- ➢ Determination of thickness of a thin wire using air Wedge method.

UNIT - II   **L: 10**

DIFFRACTION AND POLARIZATION:

DIFFRACTION: Definition of diffraction – Difference between interference and diffraction – Difference between Fresnel and Fraunhofer diffraction - Fraunhofer diffraction at single slit-cases - Grating equation.

POLARIZATION : Types of Polarization – Double refraction – Quarter wave plate - Half Wave plate

Outcome: Student will be able to understand the basic concepts of Diffraction and Polarization.

Experiments:
  - Determination of wavelength of light using spectrometer diffraction grating.
  - Determination of wavelength of laser light using diffraction grating.

Unit-III   **L: 10**

LASERS AND FIBER OPTICS:

LASERS: Characteristics of laser light – stimulated absorption, spontaneous and stimulated emission of radiation – population inversion (2-level, 3-level and 4–level schemes) - Einstein coefficients – Basic components of laser.

Ruby laser – He - Ne laser and applications of lasers –**FIBER OPTICS:**Principle of optical fiber – acceptance angle - numerical aperture - Applications of optical fibers.

Outcome: Students will be able to understand the basic concepts of optical fiber and laser. Also working principle of Ruby, He-Ne, semiconductor lasers and optical fibers. Further, their applications in day to day life.

Activity:
(Virtual lab) To calculate the beam divergence and spot size of the given laser beam.

Experiment

  - Determination of particle size of lycopodium powder using semiconductor laser.
  - Evaluation of Numerical Aperture of a given fiber
  - To determine the bending losses of Optical fibers.

Unit-IV   **L: 10**

QUANTUM MECHANICS AND FREE ELECTRON THEORY:

QUANTUM MECHANICS: Introduction – Matter waves – wavefunction – physical significance and limitations of wavefunction - Schrodinger time independent and time dependent wave equations – Particle in a one dimensional box (wavefunction and allowed energy levels).

FREE ELECTRON THEROY OF METALS: Merits and demerits of classical free electron theory – drift velocity – electrical conductivity – postulates of quantum free electron theory.

Outcome: Student will be able to summarize the importance of free electrons in determining the properties of metals. Further, student will able to apply the knowledge of basic quantum mechanics, to set up one-dimensional Schrodinger's wave equation and its application to a matter wave system.

Experiments:

➢ To determine Planck's constant using Planck's constant apparatus

Unit-V: L: 12

BAND THEORY OF SOLIDS AND SEMICONDUCTOR PHYSICS:

BAND THEORY OF SOLIDS :
Bloch theorem (qualitative) - Kronig- Penney model (qualitative) – energy bands in crystalline solids – classification of crystalline solids.

SEMIONDUCTOR PHYSICS: Introduction - bond formation in intrinsic semiconductors and extrinsic semiconductors (P-type and N-type) –intrinsic electrical conductivity -   Drift & Diffusion – Einstein's equation- Hall effect in semiconductors – Applications of Hall effect.

Outcome: Student will be able to understand the concepts of bandgap in crystalline solids and Principle of Hall effect.

Activity:
    ➢ To identify the resistance of diode according to colour banding on diode
    ➢ **(virtual lab experiment)** - To determine the resistivity of semiconductors by Four probe Method
    ➢ **(virtual lab experiment)** - 1) To determine the Hall voltage developed across the sample material. 2) To calculate the Hall coefficient and the carrier concentration of the sample material.

Experiments:

➢ To study the V-I Characteristics of solar cell.
➢ Plot V-I and P-I characteristics of light emitting diode.
➢ V-I characteristics of P-N junction and Zener diodes.
➢ Thermistor characteristics

Text Books:

1. Solid State Physics, A. J. Dekker, Macmillan India Pvt. Ltd., (2011)
2. Introduction to Solid State Physics, C. Kittel, Wiley india Pvt. Ltd, (2012)
3. Physics of Semiconductor Devices, S. M. Sze,3rd edision, John Wiley & Sons, (2007)
4. Solid State Physics: Structure And Properties Of Materials, M. A. Wahab, Narosa Publishing House Pvt. Ltd. (2005)

Reference Books:

1. Introduction to Magnetic Materials, B. D. Cullity and Charles D. Graham Jr., Wiley-IEEE Press, 2 edition, (2008).
2. A Text Book of Engineering Physics by Dr. M. N. Avadhanulu and Dr. P. G. KshiraSagar, S.Chand& Company Ltd., (2014).
3. Elements of X-Ray Diffraction, B. D. Cullity Pearson Education India; 3 edition (2014)
4. Introduction to Quantum Mechanics, David J. Griffiths ⋅ Darrell F. Schroeter, Cambridge University Press; 3 edition, (2018).
5. Introduction to Electrodynamics, David. J. Giffiths, Pearson Education India Learning Private Limited; 4 edition (2015).
6. Physics Vol 1& 2 (5ed), Resnick , Halliday, Krane, Wiley; Fifth edition (2007)

Course Code	OBJECT-ORIENTED PROGRAMMING(OOPS) THROUGH C++	L	T	P	Credits
1005191222		3	1	3	4.5

Course Overview:

This course is designed to provide a comprehensive study of the C++ programming language. It stresses the strengths of C++, which provide students with the means of writing efficient, maintainable and portable code. The nature of C++ language is emphasized in the wide variety of examples and applications. It also stresses to improve Problem solving skills

Course Objectives:

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

Course Outcomes:

	Course outcome	Skill	PO
CO1	Understand the basic terminology used in object-oriented programming	Understanding	PO1, PO2
CO2	Describe the object-oriented programming approach in connection with C++	Understanding	PO1,PO2,PO4
CO3	Apply the concepts of object-oriented programming	Applying	PO1,PO2,PO3,PO 4
CO4	Apply virtual and pure virtual function & complex programming situations	Applying	PO1, PO2,PO3,PO4

Unit-I:

INTRODUCTION TO C++

Difference between C and C++- Evolution of C++- The Object Oriented Technology-Disadvantage of Conventional Programming- Key Concepts of Object Oriented Programming- Advantage of OOP- Object Oriented Language.

Outcome:

- ✓ Be exposed to basic hardware and software concepts
- ✓ Be familiar with issues related to software design
- ✓ Master using key structured programming constructs: declarations, sequence, selection, repetition, evaluating expressions.

Activity/Event:

Compare the Syntax, escapes Sequences and Manipulators of C and C++ with Suitable Example.

Unit-II:

Classes and Objects &Constructors and Destructor

Classes in C++-Declaring Objects- Access Specifiers and their Scope- Defining Member Function Overloading Member Function- Nested class, Constructors and Destructors, - Anonymous Objects

Outcome:

- ✓ Explain the difference between call by value and call by reference
- ✓ Master using key structured programming constructs: declarations, sequence, selection, repetition, evaluating expressions.
- ✓ Outline usage of C++ functions and the concepts related to good modular design.
- ✓ Be familiar with using C++ structures.
- ✓ Explain C++ classes.

Activity/Event:

Represent your Family lineage in terms of Class and Objects, with suitable Structure Charts.

Unit-III: Operator Overloading and Type Conversion & Inheritance

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

Outcome:

- ✓ Able to overload operators.
- ✓ Be familiar with issues related to software design
- ✓ To enhance problem solving and programming skills in C++ with extensive programming projects

Activity/Event:

Simulate the Diamond Problem using LINUX Environment. Suggest the Suitable Solution for it.

Unit-IV:Pointers & Binding Polymorphisms and Virtual Functions

Pointer, Features of Pointers- Pointer Declaration- Pointer to Class- Pointer Object- The 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.

Outcome:

- ✓ Illustrate Pointer Object.
- ✓ Be familiar with using pointers and reference parameters.
- ✓ Understand issues related to software design
- ✓ Explain Virtual Pointer and Virtual Table

Activity/Event:

Simulate Virtual function and Pure Virtual Function, with suitable examples using Code-blocks, and Compare the Results. Write Down the Observations.

Unit-V: Generic Programming with Templates & Exception Handling
Generic Programming with Templates, Need for Templates- Definition of class Templates- Normal Function Templates- Over Loading of Template Function- Bubble Sort Using Function Templates .Overview of Standard Template Library . Introduction to Exception Handling: keywords try, throw and catch, multiple catch statements specifying exceptions

Outcome:

- ✓ Make us of templates in Real Time Programming.
- ✓ Outline the usage of templates.
- ✓ Be Familiar to design and implement generic classes with C++ templates.
- ✓ Show the usage of exception handling in C++ programs.

Activity/Event:

Using Vector, Sort the Elements and Observe time Complexity. Justify your answer by comparing with C program.

Text Books:

1. A First Book of C++, Gary Bronson, CengageLearing.

2. The Complete Reference C++, Herbert Schildt, TMH.

3. 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, CengageLearing.
3.computer programming with C++,kunalPimparkhede,cambridge

OBJECT-ORIENTED PROGRAMMING LAB

List of Programs

1. Exercise – 1 (Basics)
   a) Write a Simple Program on printing "Hello World" and "Hello Name" where name is the input from the user
   b) Convert any two programs that are written in C into C++
2. Exercise – 2 (Expressions Control Flow)
   a) Write a Program that computes the simple interest and compound interest.
   b) Write a Program to calculate the fare for the passengers traveling in a bus.
3. Exercise – 3 (Variables, Scope, Allocation)
   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. (Dynamic Memory Allocation)
4. Exercises –4 (Functions)
   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.
5. Exercise – 5 (Access)
   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
6. Exercise -6 (Operator Overloading)
   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
7. Exercise -7 (Inheritance)
   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
8. Exercise -8 (Polymorphism)
   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.
9. Exercise -9 (Templates)
   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
10. Exercise -10 (STL)
    a) Write a Program to implement List and List Operations.
    b) Write a Program to implementVectorandVector Operations.
    c) Write a Program to implement Deque and Deque Operations.
    d) Write a Program to implement Map and Map Operations.

Course Code		L	T	P	Credits
1004191200	**BASIC ELECTRONICS**	**3**	**0**	**0**	**3**

Course Overview:

This course deals with basic of circuit theory, electronic device circuit, logic gate and basics of sensor with more focus on the fundamental concept of electronic. This course helps the student to learn the basics circuit with the analysis of its stability factor which will be helpful for constructing and analyzing electronic circuits. Topics included in this course are **Basic Circuits analysis,** Semiconductor devices, Transistors (BJT and FET), Digital Circuits, Sensors

Course Objectives:

1 Explain the basic concept of circuit theory.

2 Explain the basic concepts of semiconductor physics and summarize the characteristics of PN junction diode in different modes of operation.

3 explain the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations and understand the various biasing techniques for BJT.

4 Design logic gates.

5 Analyze basics working and principle of sensors.

Course Outcomes:

The student will be able

	Course outcome	Level as per Bloom's Taxonomy	PO number mapped
CO1	Explain the basic concepts of Circuit theory, semiconductor physics and analyze the PN junction diode and special purpose diode.	L2,L4	PO1,PO2,PO3, PO4,PO5
CO2	Explain the BJT and FET and analyze various biasingtechniques for BJT.	L2,L4	PO1,PO2,PO3, PO4,PO5
CO3	Design electronic circuit using logic gates	L4	PO1,PO2,PO3, PO4,PO5
CO4	Analyze basics working and principle ofsensors	L4	PO1,PO2,PO3, PO4,PO5

Unit I:

Basic Circuits analysis:

Network elements classification ,Reference Directions for current and voltage, Kirchhoff's voltage Law, Kirchhoff's current law ,series and parallel connected independent sources, resistor in series and parallel ,Voltage Division, current division.

Unit II:

Semiconductor devices:

Introduction to semiconductor materials, operation and characteristics of p-n junction diode, diode resistance (static and dynamic) and junction capacitance.
Special Diodes: Zener diode, Varactor diode, LED, LCD, PIN diode,
Diode application: Rectifier

Unit III:

Transistors (BJT and FET):

BJT: Junction transistor, transistor current components, transistor as a switch and an amplifier, characteristics properties and application of different configuration(common base, common emitter, common collector), Photo transistor, stability factor (S only), BJT Biasing.

Unit IV:

 Digital Circuits:

Basic Logic gates: AND, OR, NOT, NAND, NOR, XOR, X-NOR. NAND and NOR as a universal gates. Logic gates using transistors, Half adder, Full adder.

Unit V:

Sensors:

Definition, principles of sensing and transduction, classification and Characteristics of Photo detectors: Photoconductive Detectors, Photovoltaic Detectors, Photodiode Detectors.
Principle and Basic operation: resistive Level sensor, current sensor, voltage sensor, temperature sensor.

Texts/References:

[1] W. H. Hayt, J. E. Kemmerly, and S. M. Durbin, *Engineering Circuit Analysis*, McGraw-Hill.

[2] R. J. Smith and R. C. Dorf, *Circuits, Devices and Systems,* . John Wiley India.

[3] R. L. Boylestad and L. Nashelsky, *Electronic Devices and Circuit Theory*, Pearson.

[4] Thomas L. Floyd, *Digital Fundamentals* , Pearson Education Inc.

[5] D. Patranabis*, Sensor & transducers*, PHI.

Course Code: 1000191101	**MATHEMATICS – II**	L	T	P	Credits
		3	**1**	**0**	**3**

Course Overview:

This course focuses on basic theoretical concepts and Engineering Mathematics. This course helps the students to understand mathematical tools required in the analysis of problems in Engineering and Scientific Professions. Topics included in this course are iteration methods, finite difference operators, interpolation, Numerical differentiation and integration, system of linear equations, Eigen values and Eigen vectors and quadratic forms.

Course Objectives:

1. To familiarize the students with numerical methods of solving the non-linear equations, Interpolation, Numerical differentiation and integration.
2. Course will illuminate the student in the standard concepts of Linear algebra.
3. Methods to solving system of linear equations and compute Eigen values & Eigen vectors of a real matrix.
4. To apply mathematical statements, ideas and results, with the correct use of mathematical definitions.

Course Outcomes: The student will be able

	Course outcome	**Level as per Bloom's Taxonomy**	**PO number mapped**
CO1	To understand to solve approximate roots of an equation by using different numerical methods.	L2, L3	PO1 PO2
CO2	To understand different operators and find the relation among operators and apply forward and backward formulas for compute interpolating polynomial.	L2, L3	PO1 PO2
CO3	To understand different numerical methods to solve integrations and ordinary differential equations.	L2, L3	PO1 PO2
CO4	To understand to solve the system of Linear equations by direct and iteration methods, and compute Eigen values and Eigen vectors of a matrix and study the nature of Quadratic form.	L2, L3	PO1 PO2

UNIT- I **L: 08**

Solution of Algebraic and Transcendental Equations: Introduction: The Bisection Method –

The Method of False Position – The Iteration Method – Newton-Raphson Method.

Outcome: The student will be able to understand numerical linear methods to solve non-Linear equation

Activity/Event: Solving zero of the polynomials by using different numerical methods (Ex. Spherical storage tank & floating ball problems).

UNIT II   L: 08

Interpolation: Introduction– Forward Difference, Backward difference, Central difference operators –Newton's formulae for interpolation – Gauss' Central Difference Formulae – Interpolation with unevenly spaced points-Lagrange's Interpolation formula.

Outcome: The student will be able to understand different numerical methods to compute the polynomial for the given data.

Activity/Event: Interpolating of an approximate curve for collecting data.

UNIT-III   L: 08

Numerical Integration: Trapezoidal rule – Simpson's $1/3^{rd}$ Rule –Simpson's $3/8^{th}$ Rule.

Numerical solution of Ordinary Differential equations: Solution by Taylor's series- Euler's - Runge-Kutta 4th order.

Outcome: The student will be able to understand numerical techniques to solve definite integrals and first order IVPs

Activity/Event: Solving an approximate solution of first order IVP and numerical integrations.

UNIT-IV   L: 08

Linear system of equations: Introduction-Rank-Echelon Form-Normal Form - Solution of Linear systems - Gauss elimination - Gauss Seidel method.

Outcome: Student will be able to understand to solve the system of Linear equations by analytical &numerical methods.

Activity/Event: Real-world problems can be formulated in terms of systems of linear equations and solving by using analytical and iterative methods.

UNIT-V: L: 08

Eigen values, Eigen vectors: Introduction - Eigen values - Eigen vectors - Properties (without proofs) - Cayley Hamilton theorem (without proof) - Inverse and power of a matrix by using Cayley Hamilton theorem, Reduction of Quadratic form to canonical form by using orthogonal reduction – Rank, index, signature.

Outcome: The student will able to find the Eigen values and Eigen vectors of a matrix.

Activity/Event: Finding inverse and powers of a matrix using Cayley Hamilton theorem. Study the nature of the Quadratic forms.

Text Books:

1. Higher Engineering Mathematics by H.K. Dass, S.Chand Publications.
2. Higher Engineering Mathematics 2e, B. V. Ramana, TataMcGrawHill Publishing Co. Ltd.

Reference Books:

1. Engineering Mathematics, Greenburg, 2nd Ed, Pearson education.
2. Higher Engineering Mathematics – 43rd Edition by Dr. B. S. Grewal, Khanna Publishers, New Delhi.
3. A Text book of Engineering Mathematics, N.P.Bali, Laxmi Publications (P) Ltd.
4. Advanced Engineering Mathematics, Erwin Kreszig, 8thEd, Wiley Student Edition.

Course Code:	IT Workshop	L	T	P	Credits
1005191210		0	0	3	1.5

Course Objectives:
1. Introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
2. Teach basic command line interface commands on Linux
3. Teach the usage of Internet for productivity and self pacedlifelong learning
4. Introduce Compression, Multimedia and Antivirus tools
5. Introduce Office Tools such as Word processors, Spreadsheets and Presentation tools

Unit 1: Computer Hardware

Types of Computing Devices such as PC, Laptops, Servers, Smart Phones, Tablets, other accessories, PC parts, Input/Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.

Outcomes:
Student should be able to
1. Identify various kinds Computing devices and their components.
2. Identify the different peripherals, ports and connecting cables in a PC.
3. Assemble and disassemble components of a PC

References:
1. Introduction to computer-peter Norton
2. https://explorersposts.grc.nasa.gov/post631/2006-2007/computer_basics/ComputerPorts.doc
3. https://explorersposts.grc.nasa.gov/post631/2006-2007/bitsnbyte/Digital_Storage_Basics.doc

Unit 2: Operating Systems

Virtual Machine setup:
- Setting up and configuring a new Virtual Machine
- Setting up and configuring an existing Virtual Machine
- Exporting and packaging an existing Virtual Machine into a portable format

Operating System installation:
- Installing an Operating System such as Linux on Computer hardware.

Linux Operating System commands:
- General command syntax
- Basic help commands: whatis, man, info
- Filesystem: ls, mkdir, cd, touch, chmod, rm, mv, bc, finger, who, whoami, ps, du, df
- Date and Time: cal, date,
- Filters and Text processing: echo, cat, tac, rev, more, less, head, tail, nl, cut, paste, wc, sort, uniq, cp, cmp, diff

https://www.thegeekstuff.com/2009/07/linux-ls-command-examples
https://www.pcsuggest.com/basic-linux-commands/
https://www.linuxtechi.com/25-find-command-examples-for-linux-beginners/

Outcomes:
Student should be able to:
1. construct a fully functional virtual machine (L3)
2. summarize various linux operating system commands (L2)

References:
1. https://www.vmware.com/pdf/VMwarePlayerManual10.pdf
2. https://zorinos.com/help/
3. https://zorinos.com/help/install-zorin-os/
4. https://geek-university.com/vmware-player/manually-install-a-guest-operating-system/
5. https://clearlinux.org/documentation/clear-linux/get-started/virtual-machine-install/vmw-player-preconf
6. https://www.thegeekstuff.com/2009/07/linux-ls-command-examples
7. https://www.pcsuggest.com/basic-linux-commands/
8. https://www.linuxtechi.com/25-find-command-examples-for-linux-beginners/

Unit 3: Internet

Internet Services:
- Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/plugins
- Antivirus installation, configuring a firewall, blocking pop-ups
- Google search techniques(text based, voice based)
- alexa website traffic statistics
- Email creation and usage
- google hangout/skype/gotomeeting video conferencing
- archive.org for accessing archived resources on the web
- Creating a Digital Profile on LinkedIn, Twitter, Github

Outcomes:

Students should be able to
1. apply google search techniques (L3)
2. create their own digital profile on social media (L3)

References:

1. http://www.googleguide.com/advanced_operators_reference.html
2. https://www.alexa.com/find-similar-sites
3. https://www.alexa.com/topsites examine links Global, By Country and By Category
4. Use https://archive.org/ to locate missing links in other sites.

Unit 4: Productivity Tools
Productivity Tools:
- archival and compression tools

- scanning and image editing tools
- audio players, recording using Mic, editing, podcast preparation
- video players, recording using webcam/camcorder, editing
- podcast, screencast, vodcast, webcasting

Outcomes:

Students should be able to :

1. archive and unarchive data on the filesystem using relevant compression tools(L2)
2. edit photos & images in various formats using photo & image editing tools (L2)
3. recognize characters & extract text from scanned images (L2)
4. create audio files and podcasts (L4)
5. create video tutorials and publishing (L4)

References:

1. File Archivers: https://en.wikipedia.org/wiki/File_archiver .
   Comparison of file archivers:
   https://en.wikipedia.org/wiki/Comparison_of_file_archivers
2. Audio editing software: https://en.wikipedia.org/wiki/Audio_editing_software
   Comparison of free software for audio:
   https://en.wikipedia.org/wiki/Comparison_of_free_software_for_audio
3. Video editing software: https://en.wikipedia.org/wiki/Video_editing_software
   Comparison of video editing software:
   https://en.wikipedia.org/wiki/Comparison_of_video_editing_software
4. Podcast: https://en.wikipedia.org/wiki/Podcast, Screencast:
   https://en.wikipedia.org/wiki/Screencast, Webcast: https://en.wikipedia.org/wiki/Webcast

Unit 5: Office Tools

Cloud based productivity enhancement and collaboration tools:

- Store, sync, and share files with ease in the cloud
  - Google Drive
- Document creation and editing text documents in your web browser
  - Google docs
- Handle task lists, create project plans, analyze data with charts and filters
  - Google Sheets
- Create pitch decks, project presentations, training modules
  - Google Slides
- Manage event registrations, create quizzes, analyze responses
  - Google Forms
- Build public sites, internal project hubs
  - Google Sites
- Web-based service providing detailed information about geographical regions and sites around the world. Explore the globe by entering addresses and coordinates
  - Google Maps and Earth
- Online collaboration through cross-platform support
  - Jamboard
- Keep track of important events, sharing one's schedule, and create multiple calendars.
  - Google Calendar

Outcomes:

Students should be able to :
1. Use office tools for documentation (L2)
2. Build interactive presentations (L2)
3. Navigate through the globe (L2)
4. Build websites (L2)
5. Create quizzes & analyze responses (L3)

References:
1. Cloud computing, productivity and collaboration tools, software and products offered by Google: https://en.wikipedia.org/wiki/G_Suite,
2. G Suite Learning Center: https://gsuite.google.com/learning-center/products/#!/

Course Outcomes:

Students should be able to :

1. Assemble and disassemble components of a PC (L3)
2. Construct a fully functional virtual machine (L3)
3. Summarize various linux operating system commands (L2)
4. Secure a computer from cyber threats (L2)
5. Apply google search techniques (L3)
6. Create their own digital profile on social media (L3)
7. Edit photos & images in various formats using photo & image editing tools (L2)
8. Recognize characters & extract text from scanned images (L2)
9. Create audio files and podcasts (L4)
10. Create video tutorials and publishing (L4)
11. Use office tools for documentation (L2)
12. Build interactive presentations (L2)
13. Build websites (L2)
14. Create quizzes & analyze responses (L3)

Course code		L	T	P	Credits
1000191130	**CONSTITUTION OF INDIA** **(Audit Course)**	2	0	0	0

Course Overview: This course introduces students to the Constitution of India. It begins by providing an overview of the history of the making of Indian Constitution. It then discusses the preamble and the basic structures of the Constitution. The fundamental rights, duties and the directive principles of state policy will be discussed thoroughly, followed by a discussion of the legislature, the executive and the judiciary. Some of the important sections of the Constitution that have influenced the history of India since independence will also be taken up for study. These include emergency powers and special provisions.

Course Objectives:
1. To Enable the student to understand the importance of constitution
2. To understand the structure of executive, legislature and judiciary
3. To understand philosophy of fundamental rights and duties
4. To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
5. To understand the central and state relation financial and administrative

	Course outcome	Bloom's cognitive level	PO
CO1	Have general knowledge and legal literacy and thereby to take up competitive examinations.	Understanding	PO-6 PO-8 PO-9
CO2	Understand state and central policies, fundamental duties.	Understanding	PO-6 PO-8 PO-9
CO3	Understand Electoral Process, special provisions.	Understanding	PO-6 PO-8 PO-9
CO4	Understand powers and functions of Municipalities, Panchayats and Cooperative Societies	Understanding	PO-6 PO-8 PO-9

Unit-I: No. of lecture hours: 6

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

Outcome: After completion of this unit student will
- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties

UNIT II: **No. of lecture hours: 6**

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

Outcome: After completion of this unit student will
- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

Activity: role play of model parliament

Unit-III: **No. of lecture hours: 6**

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

Outcome: After completion of this unit student will
- Understand the structure of state government
- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat
- Differentiate between structure and functions of state secrateriate

Activity: Quiz role play of model assembly.

Unit-IV: **No. of lecture hours: 6**

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

Outcome: After completion of this unit student will
- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Myer and elected representatives of Municipalities
- Evaluate Zillapanchayat block level organization

Activity: Debate on pros and cons of local governance

Unit-V: **No. of lecture hours: 6**

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

Outcome: After completion of this unit student will
- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissiononerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

Activity: Debate on election system in India

Text Books:

4. Civics, Telugu Academy

References:

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

II Year- I Semester

S.No	Course Code	Name of the Course	L	T	P	Credits
1	1005192100	Discrete Mathematical Structures	3	1*	0	3
2	1005192101	Digital Logic Design	3	1*	0	3
3	1005192120	Data structures through c	3	1*	3	4.5
4	1005192121	Java Programming	3	0	3	4.5
5	1099192100	Managerial Economics And Financial Analysis	3	0	0	3
6	1020192100-1020192102	Open Elective-I	3	0	0	3
7	1005192170	Mini project-I(EPICS/Societal Relevant Project)	0	0	2	1
8	1000192130	Environmental Science	2	0	0	0
Total Credits :						**22**

Course Code	DISCRETE MATHEMATICAL STRUCTURES	L	T	P	Credits
1005192100		3	1	0	3

Course Overview: The purpose of this course is to provide the students with solid foundations in the basic concepts of Set theory, mathematical logic, recurrence relations, graph theory concepts, and algorithms. The main objective of the course is to teach the students to improve the logical thinking and problem solving skills.

Course Objectives:
- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning.
- To introduce the algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science.

Course Outcomes: After taking the course, students will be able to

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	To demonstrate skills in solving counting problem	Applying	PO1, PO2, PO3, PO4,PO7,PO12
CO2	To develop reasoning skills using Mathematical Logic concepts.	Analyzing	PO1, PO2, PO3,PO10,PO12
CO3	To identify the solutions for various problems using recurrence relations	Analyzing	PO1, PO2,PO12
CO4	To apply concepts of graph theory for a given problem.	Applying	PO1, PO2, PO3, PO12

UNIT- I:SETS & COMBINATORICS   L-9 T-1

SETS: Sets and subsets, set operations and the Laws of set theory, Counting and Venn Diagrams,

COMBINATORICS: Permutations, Combinations, Binomial and Multinomial Theorems, the Principles of Inclusion–Exclusion, Pigeonhole Principle and its Application.
Outcome: Student will be able to demonstrate skills in solving counting problem

Activity: Solve counting problems for real-time applications.

UNIT -II: MATHEMATICAL LOGIC   L-9 T-2

Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Logical Equivalence, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus.

Predicate Calculus: Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

Outcome:
Student will be able to comprehend mathematical principles and logic

Activity:
Identify applications of mathematical principles in real-time and implement it with in programs.

UNIT- III: RELATIONS, FUNCTIONS AND ALGEBRAIC STRUCTURES   L-9 T-2

Relations: Properties of Binary Relations, Relation Matrix and Digraph, Transitive Closure, Equivalence and Partial Ordering Relations, Hasse Diagrams.

Functions: Bijective Functions, Composition of Functions, Inverse Functions, Permutation, Recursive Functions and Hashing functions

Algebraic Structures: Semi Groups and Monoids, Homomorphism of Semi Groups and Monoids, Group, Subgroup, Abelian Group.

Outcome:
 Student will be able to demonstrate knowledge of mathematical modeling and proficiency   in using mathematical software.

Activity:
Select an appropriate optimized sorting/searching technique for a real-time application and justify.

UNIT- IV: GENERATING FUNCTIONS & RECURRENCE RELATIONS: L-9 T-1

GENERATING FUNCTIONS: Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions

RECURRENCE RELATIONS: Formulation as Recurrence Relations, Solving Recurrence Relations by Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations.
Outcome:
Students will be able to apply induction and other proof techniques towards solving recurrences

and other problems in elementary algebra.

Activity:
1. Recurrence relations are used when an exhaustive approach to problem solving is simply too arduous to be practical. Although it is not ideal to compute the terms in a sequence one at a time by using previous terms, this approach can be much more efficient than the alternative of exhaustive casework.

UNIT -V: GRAPH THEORY   L-9 T-2

Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Adjacency List, Directed Graph, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Algorithms for Spanning Trees (Problems Only and Theorems without Proofs).

Outcome:
1. Student will be able to manipulate and analyze data numerically and/or graphically using appropriate Software.
2. Demonstrate the use of Trees, Binary Trees in various applications.

Activity: Construct Graphs for an real time Application.

TEXT BOOKS

1. Discrete Mathematical Structures with Applications to Computer Science,J. P. Tremblay and P. Manohar, Tata McGraw Hill.

2. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

REFERENCE BOOK

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel, T.P. Baker, 2nd Edition, Prentice Hall of India.

2. Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby, Sharon Cutler Ross, PHI.

3. Discrete Mathematics, S. K. Chakraborthy and B.K. Sarkar, Oxford, 2011.

4. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3rdEdition, Tata McGraw Hill.

Course Code	DIGITAL LOGIC DESIGN	L	T	P	Credits
1005192101		3	1	0	3

Course Overview: Course Overview: This course provides an introduction to logic design and the basic building blocks used in digital systems, in particular digital computers. It starts with a discussion of combinational logic: logic gates, minimization techniques, arithmetic circuits, and modern logic devices such as field programmable logic It also deals with sequential circuits: flip-flops, synthesis of sequential circuits, and case studies, including counters and registers

Course Objectives:
- To solve typical number base conversions
- To optimize logic gates using various techniques
- To introduce the basic tools for designing combinational and sequential digital logic.

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Apply the principles of number system, binary codes and Boolean algebra to minimize logic expression	UNDERSTAND	PO1,PO2,PO12
CO2	Analyze functionality of digital circuits	ANALYZE	PO1,PO2,PO7,PO12
CO3	Design efficient combinational logic circuit implementations from functional description of digital systems	APPLY	PO1,PO2,PO3,PO5,PO12
CO4	Demonstrate the use of sequential circuits and storage elements in real-time applications.	APPLY	PO1,PO2,PO3,PO5,PO12

UNIT- I: L-9 T-2

Digital Systems and Binary Numbers Digital Systems, Binary Numbers, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Arithmetic addition and subtraction, 4-bit codes: BCD, EXCESS 3, alphanumeric codes, 9's complement, 2421, etc..

Outcome:
- To define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation

Activity: Illustrate how number system is applicable in real time with an example.

UNIT -II: L-8 T-2

Concept of Boolean algebra Basic Theorems and Properties of Boolean algebra, Boolean Functions, Canonical and Standard Forms, Minterms and Maxterms. Gate level Minimization

Map Method, Three-Variable K-Map, Four Variable K-Maps, Qc-Mc method. Products of Sum Simplification, Sum of Products Simplification, Don't – Care Conditions, NAND and NOR Implementation, Exclusive -OR Function.

Outcome:
- Demonstrate Gate-Level minimization through Boolean algebra**.**
- Evaluate and simplify logical functions using Boolean algebra.

Activity: Reduce Boolean expression by applying Boolean algebra postulates and manipulate into SOP/POS form and verify it with Truth table.

UNIT- III: L-9 T-2
Combinational Logic Introduction, Analysis Procedure, Binary Adder–Subtractor, Binary Multiplier, Decoders, Encoders, Multiplexers, Demultiplexers, Priority Encoder, Code Converters, Magnitude Comparator, HDL Models of Combinational Circuits

Outcome:
- Analyze and design combinatorial circuits

Activity: Design combinational circuit using HDL .
UNIT- IV: L-7 T-1
Synchronous Sequential Logic: Introduction to Sequential Circuits, Storage Elements: Latches, Flip-Flops, RS- Latch Using NAND and NOR Gates, Truth Tables. RS, JK, T and D Flip Flops, Truth and Excitation Tables, Conversion of Flip Flops.

Outcome:
- Understand basics of sequential circuits and can perform conversions of flipflop

Activity: summarize the working of all flipflops
UNIT -V: L-6 T-1
Registers and Counters Registers, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counter, Johnson Counter.

Outcome:
- Analyze Sequential circuits

Activity: Demonstrate the use of sequential circuits and storage elements in real-time applications.

Text Books:
1. Digital Design, 5/e, M.Morris Mano, Michael D Ciletti, PEA.
2. Fundamentals of Logic Design, 5/e, Roth, Cengage.

Reference Books:
1. Digital Logic and Computer Design, M.Morris Mano, PEA.
2. Digital Logic Design, Leach, Malvino, Saha, TMH.
3. Modern Digital Electronics, R.P. Jain, TMH.

Course Code	**DATA STRUCTURES THROUGH C**	L	T	P	Credits
1005192120		3	1	3	4.5

Course Overview: Data Structure is a systematic way to organize data in order to use it efficiently. Following terms are the foundation terms of a data structure. The purpose of this course is to provide the students with solid foundations in the basic concepts of programming: data structures and algorithms. The main objective of the course is to teach the students how to select and design data structures and algorithms that are appropriate for problems that they might encounter. This course is also about showing the correctness of algorithms and studying their computational complexities. This course offers the students a mixture of theoretical knowledge and practical experience. The study of data structures and algorithms is carried out with C Language

Course Objectives:

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

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Apply the concept of linear and non-linear data structures to various applications	Apply	PO1,PO2,PO7,PO8,PO12
CO2	Analyze and implement operations on linked lists and demonstrate their applications.	Analyze	PO1,PO2,PO3, PO5,PO12
CO3	implement stacks and queues using arrays and linked lists	APPLY	PO1,PO2,PO3,PO7,PO12
CO4	develop programs by nonlinear data structures such as tree and graphs	Apply	PO1,PO2,PO3,P O4,PO5 ,PO7,PO12

UNIT-I   **L-6   T-1**

ARRAYS AND LINKED LISTS: Abstract Data Types(ADTs) , Dynamic allocation of Arrays, Structures and unions, Polynomials, Spares Matrices Representation of multidimensional Arrays. Single Linked List and Chains, Representing Chains in C, Polynomials, Polynomial Representation- Adding Polynomials- Circular List Representation of Polynomials, Equivalence Classes, Sparse Matrices, Sparse Matrix Representation- Sparse Matrix Input-Deleting a Sparse

Matrix, Doubly Linked Lists.

Outcome:
1. Differentiate primitive and non primitive data structures.
2. Design and apply appropriate data structures for solving computing problems.
3. Real time applications of arrays and Linked Lists.

Experiments:
1. Implement single linked list.
2. Implement of Doubly linked list.
3. Implement double ended queue using a doubly linked list and an array.

UNIT-II   **L-10   T-3**
Stacks and Queues: The Stack, Stacks using Dynamic Arrays, Recursion, Linked Stacks, The Queue, Linked Queues, Circular Queues using Dynamic Arrays, Dequeue. Application of stacks and queues, Evaluation of Expressions, Expression- Postfix Notation- Infix to Postfix Towers Of Hanoi Problem
Outcome:
- Implement standard data structures like stack, queue
- Able to implement real time applications on Stacks and Queues.

Experiments:

1. Develop C programs to implement the following using an array.
   Stack b) Queue
2. Develop C program to Implement Multistack in a Single Array
3. Develop a C program to do the following a) Infix to postfix conversion. b) Evaluation of postfix expression.

UNIT-III   **L-8   T-1**
Searching and Sorting: Searching: Linear Search, Binary Search, Fibonacci search. Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort Merging, Iterative Merge Sort, Recursive Merge Sort, Heap Sort

Outcome:
- Apply sorting and searching algorithms to the small and large data sets.

Experiments:

1. Develop C programs to implement the following using an array
   Linear search b) binary search
2. Develop a C Program to find number of comparisons and swapping for a given list of numbers
   Bubble Sort b) Selection Sort.
3. Develop a c program to implement
   a)Merge Sort   b)quicksort

UNIT-IV   **L-7   T-1**
TREES: Introduction, Terminology, Representation of Trees, Binary Trees, The Abstract Data Type, Properties of Binary Tress, Binary Tree Representations, Binary Tree Traversal and Tree

Iterators, Introduction, Inorder Traversal Preorder Traversal, Postorder Traversal, Threaded Binary Trees, Inorder Traversal of a Threaded Binary Tree, Inserting a Node into a Threaded Binary Tree

Outcome:
- Summarize basic tree concepts, operations and applications.
- Apply basic data structures such as trees for real-time applications.

Experiments:

1.Write C programs that use non-recursive functions to traverse the given binary tree in
a) Pre-order b) In-order c) Post-order.

UNIT-V   **L-9 T-2**

Advanced Concept of Trees: Binary Search Trees, Definition, Searching a Binary Search Tree, Insertion into a Binary Search Tree, Deletion from a Binary Search Tree, Height of Binary Search Tree. Heaps, Definition of a Max/Min Heap, Insertion into a Max/Min Heap, Deletion from a Max/Min Heap

GRAPHS: Terminology, Operations, Graph traversals.

Outcome:
- Demonstrate the use of Heaps in various applications.
- Demonstrate the use of Binary Search Trees in various applications.

Experiments:
1. Implementation of Binary Search trees.
2. Implementation of Heaps.

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

Reference Books:
1. Classic Data Structures, Debasis Samantha, PHI. (Second Edition)
2. Data Structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.

Data Structures using C, Reema Thareja, Oxford Home Publications, Second Edition.

Course Code	JAVA PROGRAMMING	L	T	P	Credits
1005192121		3	1	3	4.5

Course Overview:

JAVA is purely object oriented programming language. It is the fundamental course to develop internet based applications.

Java Programming is an important language in software development career which develops real time problem solving skills. It is the mandatory course for learning ANDROID development, JAVASCRIPT, Advanced JAVA Concepts, HADOOP Technologies, SELINIUM testing tool, etc. The Core JAVA is designed for beginners and this Specialization will gives you core programming concepts and equip you to write programs to solve complex problems. In addition, you will gain the foundational skills a software engineer needs to solve real-world problems, from designing algorithms to testing and debugging your programs.

Course Objectives:

Understanding the OOP's concepts like Data Abstraction, Encapsulation, Inheritance, Polymorphism, Multithreading, Files etc

Gain the knowledge about the relationship between the classes and objects.

- To understand and apply the concepts of Applets and Event Handling.

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Relate the procedural and object paradigm, with real world entities	Understand	PO1,PO7,PO12
CO2	Use Exception handling and multithreading mechanisms to create efficient software application	Apply	PO1,PO2,PO7, PO12
CO3	Implement GUI Applications with modern tools	Apply	PO2, PO3,PO5,PO7, PO12
CO4	Design various layouts along with applet usage	Create	PO2,PO3,PO5, PO12

UNIT- I: **L-10 T-2**

Introduction to OOPs, Procedural Programming Language Vs Object Oriented Language, Principles of OOPs, History of java, Java features, JVM architecture, Structure of java Programming.
Variables, Data Types: Primitive and Reference, Identifiers, Operators, Expressions, Primitive type conversion and Casting, Control Structures

Outcome:

After reading this Unit, student should be able to understand:
- Be familiar with Object oriented programming techniques.

- Explain the structure of the program
- Demonstrate various control structures in JAVA.

Experiment:
a) Write a JAVA program to display default value of all primitive data type of JAVA
b) Write a JAVA program to formatting the output.
c) Write a Java program that uses both recursive and non-recursive functions to print the nth value in the Fibonacci sequence.
d) Write a JAVA program to store bank details of the customers

UNIT -II: **L-11 T-2**
Class fundamentals, creating objects: Referenced and unreferenced, methods in java: Static and non-static, method overloading, recursion, Constructor and Constructor overloading, Command Line Arguments, SCANNER class and its methods, Importance of Static keyword and examples, this keyword: this. and this(), Arrays

Outcome: After reading this Unit, student should be able to understand:
- Outline the relation between class and object.
- Illustrate the difference between method and constructor overloading.
- Make use of static keyword and this keyword.
- Analyze the Command Line arguments.

Experiment:
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.
e) Write a JAVA program to implement Constructor.
f) Write a JAVA program to implement Constructor Overloading
g) Write a JAVA program to implement static keyword in all cases.
h) Write a JAVA program to implement this keyword at variable and method level
i) Write a JAVA program to implement Matrix Transpose

UNIT- III: **L-13 T-2**
Inheritance: Types of inheritance, super keyword: super. and super(), final keyword, Method Overriding.

Abstract class: Creation, Abstract method, Concrete Class Vs Abstract class.

Interfaces: Multiple Inheritance by Interfaces, Inheritance in Interfaces, Abstract class Vs Interface.

Packages: Creating User defined Packages, Using predefined packages

Exception handling: Exception Types, Using try and catch, multiple catch clause, multiple try-catch clause, Handling unknown exception, finally block, throw, throws, user-defined exceptions.

Outcome: After reading this Unit, student should be able to understand:
- Classify various types of Inheritance.
- Illustrate the difference between method overloading and overriding.
- Demonstrate to usage of Packages.

- Make use of Exception Handling.
- Develop and make use of synchronization through multithreading.

Experiment:

a) Write a JAVA program to implement Single Inheritance
b) Write a JAVA program to implement multi level Inheritance
c) Write a JAVA program give example for "super" keyword
d) Write a JAVA program to implement class mechanism. – Create a class, methods and invoke them inside main method.
e) Write a JAVA program to implement method overloading.
f) Write a JAVA program to implement abstract class
g) Write a JAVA program to implement Interfaces with inheritance
h) Write a JAVA program that describes exception handling mechanism
i) Write a JAVA program Illustrating Multiple catch clauses
j) Write a JAVA program to implement finally block
k) Write a JAVA program for creation of Illustrating throw and throws
l) Write a JAVA program for creation of User Defined Exception

UNIT- IV: **L-9 T-2**

Multithreading: introduction, thread life cycle, creation of threads: Runnable Interface and Thread Class, Stop a thread in middle, sleep() method, thread priorities, thread synchronization: Synchronized block and Synchronized keyword, Thread Communication: wait() and notify().

File Handling: File operations, Character Stream Classes, Byte Stream Classes..

Outcome: After reading this Unit, student should be able to understand:
- Explain the structure of Applet Program.
- Construct an approach for event delegation model.
- Build the frame based applications using event handling mechanism.

Experiment:

a) Write a JAVA program to implement file handling mechanism
b) Write a JAVA program to implement Producer and Consumer Problem
c) Write a JAVA program to implement IRCTC application for ticket booking through synchronization.

UNIT -V: **L-6 T-1**

Applet: Creation of Applet class, Applet life cycle, create different shapes in applet.

Event handling: event delegation model, Mouse Handling Events, Keyboard Handling events

Outcome:
After reading this Unit, student should be able to understand:
- Extend the importance of AWT.
- Develop the components and containers in AWT.
- Develop the GUI application using checkboxes, radio buttons, List Boxes etc.
- Construct different types of Layouts.

Experiment:

a) Write a JAVA program to create different shapes and fill colors using Applet.
b) Write a JAVA program that display the x and y position of the cursor movement using Mouse.
c) Write a JAVA program that identifies key-up key-down event user entering text in a Applet.

TEXT BOOKS
1. The complete Reference Java, 8th edition, Herbert Schildt, TMH.
2. Programming in JAVA, Sachin Malhotra, Saurabh Choudary, Oxford.
3. Introduction to java programming, 9th edition by Y Daniel Liang, Pearson.

REFERENCE BOOK
1. E.Balaguruswamy, "Programming with Java A Primer",4th Edition, TataMcGraw-Hill, 2009
2. Timothy budd, "An introduction to object-oriented programming", 3rd Edition, Pearson Education, 2009.
3. Ivor Horton, "Beginning Java", 7thEdition, Wrox Publications, 2011.
4. Object Oriented Programming through Java, P. Radha Krishna, Universities Press.
5. C. Thomas Wu, "An introduction to Object-oriented programming with Java", Fourth Edition, Tata McGraw-Hill Publishing company Ltd., 2006.
6. Java 8 Programming Black Book by Dt Editorial Services, John Wiley.

Course Code	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS	L	T	P	Credits
1099192100		3	0	0	3

Course Overview: The present course is designed in such a way that it gives an overview of concepts of Economics. Managerial Economics enables students to understand micro environment in which markets operate how price determination is done under different kinds of competitions. Financial Analysis gives clear idea about concepts, conventions and accounting procedures along with introducing students to fundamentals of ratio analysis and interpretation of financial statements. Break Even Analysis is very helpful to the Business Concern for Decision Making, controlling and forward Strategic Planning. Ratio analysis gives an idea about financial forecasting, financial planning, controlling the business and decision making

Course Objectives:

1. Understand the concepts of managerial economics and the market dynamics namely Demand, Elasticity of demand and pricing in different market structures.
2. Acquire the knowledge about production theories and cost analysis besides dealing with the production and factors of production.
3. Analyze the different market structures and understand various pricing methods which are adopted in attracting the customers under different markets.
4. To provide the basic knowledge on financial accounting
5. To understanding Capital budgeting decisions.

Course Outcomes:

	Course outcome	**Cognitive Level as per Bloom's Taxonomy**	**PO**
CO1	Analyze the Demand, Price and Cost.	Understand	PO3, PO8, PO11, PO12
CO2	Identify the Nature of different markets to determine Price Output for different Business Units	Understand& Apply	PO5, PO8, PO11, PO12
CO3	Understand Various Business Forms	Understand	PO5, PO8, PO11, PO12
CO4	Evaluate investment project proposals	Apply &Analyze	PO3, PO11, PO12

Unit-I:

Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law ofDemand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting. Price Indices (WPI/CPI)

Unit-I Outcome: Analyze the Demand, Price and Cost.

Activity/Event on Unit-1: Presentations and object oriented tests

Unit-II: Production and Cost Analyses: Concept of Production function- Cobb-Douglas Production function- Leontief production function - Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(simple problems)-Managerial significance and limitations of breakeven point

Unit-II Outcome: Analyze the Demand, Price and Cost.

Activity/Event on Unit-II: Presentations and object oriented tests

Unit-III: Introduction to Markets, Theories of the Firm & Pricing Policies: Managerial Theories of firm: Marris and Williamson's models – Significance of Pricing and various methods of pricing with contemporary examples.Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price andOutput Determination

Unit-III Outcome: Identify the Nature of different markets to determine Price Output for different Business Units

Activity/Event on Unit-III: Presentations and object oriented tests

Unit-IV: Types of Business Organization and Business Cycles: Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and theirforms – Business Cycles : Meaning and Features – Phases of Business Cycle.

Unit-IV Outcome: Understand Various Business Forms

Activity/Event on Unit-IV: Presentations and object oriented tests

Unit-V: Introduction to Accounting and Capital Budgeting Decisions:

Part I: Introduction to Accounting, Double Entry Systems Journal, Ledger, Trail Balance,

preparation of Financial Statements (Problems).

Part-II: Capital Budgeting Decisions: Classification of Capital- Methods of appraising Project profitability: Traditional Methods (Payback period, Accounting rate of return) and Time value of money- Modern methods (Net Present Value method, Internal Rate of Return Method and Profitability Index Method) - Problems

Unit-V Outcome: Evaluate investment project proposals

Activity/Event on Unit-V: Presentations and object oriented tests

Text Books:

1. M.Kasi Reddy & Saraswathi, "Managerial Economics and Financial Analysis", PHI Publications, New Delhi, 10th Revised Edition, 2012.
2. Varshney & Maheswari, "Managerial Economics", Sulthan Chand Publishers, 1st Revised Edition, 2009.
3. S.N. Maheshwari & S.K.Maheshwari, "Financial Accounting", Vikas Publication House Pvt.Ltd, 4th Edition, 2012.

Reference Books:

1. 1 D.N. Dwivedi, "Managerial Economics", Vikas Publication House Pvt.Ltd, 2nd Edition, 2012.
2. R.Narayana Swamy, "Financial Accounting- A managerial Perspective", Pearson publications, 1st Indian Reprint Edition, 2012.
3. J.V.Prabhakar Rao & P.V.Rao, "Managerial Economics & Financial Analysis", Maruthi Publishers, 1st Revised Editon, 2011

Course Code	EMPLOYABILITY READINESS	L	T	P	Credits
1020192100	PROGRAM-1	3	0	0	3

Course Overview

In this course students get knowledge of analytical thinking,standard operation methods, verbal ability, career-oriented skills, numerical ability, mensuration, data interpretation,arithmetical ability, logical ability and reasoning

Course Objectives:
- To encourage the all-round development of students by focusing on verbal ability
- To perform better during Campus Recruitment and variousinterviews they face in their career.
- To enhance the problem solving skills, to improve the basic mathematical skills and to help students who are preparing for any type of competitive examinations.
- Toenhance the problem solving skills in the area of Quantitative Aptitude' and 'Reasoning' which will enable the students to achieve in Campus Placements and competitive examinations.

Course Outcomes: After taking the course, students will be able to

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Students have the adequate writing **skills** that are needed in an organization	Understanding	PO9 ,PO10
CO2	Understand the core competencies to succeed in professional and personal life	Understanding	PO9, PO10
CO3	Solve various Basic Mathematics problems by following different methods and to perform well in various competitive exams and placementdrives.	Understanding and applying	PO1, PO4
CO4	Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems and confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life.	Understanding and applying	PO1, PO2

Unit-I:

Verbal:

English Grammar and Vocabulary, Noun &Pronoun,Verbs (Lexical& Auxiliary),Verb Tenses,Adjectives & Adverb Preposition,Conjunction, Phrases and Clause

Aptitude/ Logical Reasoning:

Number System: Speed maths, Numbers, Factors, prime & Co primes, LCM;HCF, Divisibility rules, finding unit place digit and last two digits of an expression.

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

Outcome:

1. Demonstrate the knowledge of all parts of speech's

2. Apply shortcut methods to solve mathematical problems

Activity/Event :

1. Quiz on Parts of Speech

2. Brain Teasers (Number System) and Puzzles on Blood Relations

UNIT -II:

Verbal: Sentence Types, Transformations, Word meanings, synonym, Antonym,Root words, one word substitutes, Phrasal Verbs, Idioms,Word games – Vocabulary development

Aptitude/ Logical Reasoning:

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

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

Simple and Compound Interest: Problems on Interest (I), Amount (A), Principal (P) and Rate ofInterest(R),Difference between the simple interest and compound interest for 2 and 3 years.

Outcome:

1.Understand the vocabulary and grammar

2. Follow strategies in minimizing time consumption in problem solving and to perform well in various competitive exams and placement drives.

Activity/Event :

- Stock Market Game

- Class Business

- Budget Tracking

- Role Play on : (Sentence Transformations ;Types of Sentence)

- Semantic Maps (Vocabulary Development).

- Eye Spy

Unit-III:

Verbal:

Reading Comprehension, Comprehension: The Goal of Reading, General strategies for Reading Comprehension, Strategies for Reading Comprehension: Narrative Text, Strategies for Reading Comprehension: Expository Text, Main Idea/Summarization

Aptitude/ Logical Reasoning:

Partnership:Relation between partners, period of investment and shares

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

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

Outcome:

1. Understand the core competencies to succeed in personal life

2. Utilize these mathematical skills both in their professional as well as personal life

Activity/Event :

Box Plots

Brain Teaser/Puzzle

KWL Chart & Story Map

UNIT- IV:

Verbal:

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

modifiers, Parallelism, Error in diction, Wrong comparisons

Aptitude/ Logical Reasoning:

Time and Work: Men and Days, Work and Wages, hours andwork, Alternate days concept,

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

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

Outcome:

1.Understand the core competencies to succeed in professional and personal life

2.Solve various Basic Mathematics problems by following different methods

Activity/Event :

Brain Teaser/Puzzle

Use sticky notes

Tic-tac-toe

UNIT -V:

 Verbal: E-mail,Essay Writing, Tips on Writing an Effective Essay, Cloze Test, Cloze Test – Introduction to the Concept, Tips and Tricks to Solve Cloze Test

Aptitude/ Logical Reasoning:

Series &Progressions: Arithmetic, Geometric and Harmonic Progressions, Arithmetic Mean, Geometric Mean and Harmonic   Mean and their relations.

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

Probability: Definition of probability, notations and formulae, problems on probability

Outcome:

1.Students have the adequate writing **skills** that are needed in an organization

2. Solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life.

Activity/Event :

Picture Stories(PPDT Images)

Word Grab

Brain Teaser/Puzzle

TEXT BOOKS

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

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

3. Arun Sharma and Meenakshi Upadhyay for verbal ability

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

REFERENCE BOOK

1. Quantitative Aptitude – Abhijit Guha, McGraw Hills. Logical Reasoning, Arun Sharma, McGraw Hill.

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

Course Code	**PUBLIC ADMINISTRATION**	L	T	P	Credits
1020192101		3	0	0	3

Course Overview:

The course will provide an overview of the field of public administration by focusing on its development and importance in modern government operations at the local, state, and federal levels. It will familiarize the students with the basic principles, concerns, and methods of public administration.

Course Objectives:

Students will be able to:

➢ Understand definition, scope, approach and theories of public administration.
➢ Identify the process and technique of decision making and also understand the concept of administrative behaviour and control.
➢ Will be able to understand the process and technique of personnel and financial administration.
➢ Discuss the tools that modern public administrators use to pursue public goals and public policy, along with the pros and cons of those tools.
➢ Explain the major administrative techniques and values that public administration has and illustrate how those affect the work of government and also understand the process of administrative improvement.

Course Outcomes:

At the end of the course the student will be able to

	Course Outcome	**Cognitive level as per Bloom's Taxonomy**	**PO**
CO1	Understand definition, scope, approach and theories of public administration.	Remembering and Understanding (L1 &L2)	PO-2 PO-6 PO-12
CO2	Identify the process and technique of decision making and also understand the concept of administrative behaviour and control.	Understanding and Analyzing (L2&L4)	PO-6 PO-12
CO3	Understand the process and technique of personnel and financial administration.	Understanding and applying (L2&L3)	PO-06 PO-09 PO-11 PO-12

CO4	Discuss the tools that modern public administrators use to pursue public goals and public policy, along with the pros and cons of those tools.	Understanding, Applying Evaluating (L2, L3&L5)	PO-06 PO-09 PO-12
CO5	Understand and explain the major administrative techniques and values that public administration has and illustrate how those affect the work of government and also understand the process of administrative improvement.	Understanding, Applying Evaluating (L2, L3&L5)	PO-06 PO-08 PO-09 PO-12

UNIT I. Introduction:

Meaning, scope and significance of Public Administration; Wilson's vision of Public Administration; Evolution of the discipline and its present status; New Public Administration; Public Choice approach; Challenges of liberalization, Privatization,Globalization; Good Governance: concept and application; New Public Management. Organization Theories

UNIT II Accountability and control & Administrative Behaviour

Process and techniques of decision-making; Communication; Morale; Motivation Theories – content, process and contemporary; Theories of Leadership: Traditional and Modern. Legislative, Executive and Judicial control over administration; Citizen and Administration; Role of media, interest groups, voluntary organizations; Civil society; Citizen's Charters; Right to Information; Social audit.

UNIT-III Personnel and Financial Administration:

Importance of human resource development; Recruitment, training, career advancement, position classification, discipline, performance appraisal, promotion, pay and service conditions; employer- employee relations, grievance redressal mechanism; Code of conduct; Administrative ethics. Monetary and fiscal policies; Public borrowings and public debt Budgets - types and forms; Budgetary process; Financial accountability; Accounts and audit.

UNIT-IV: Public Policy:

Models of policy-making and their critique; Processes of conceptualization, planning, implementation, monitoring, evaluation and review and their limitations; State theories and public policy formulation. Women and development - the self-help group movement.

UNIT-V Techniques of AdministrativeImprovement:

Organization and methods, Work study and work management; e-governance and information technology; Management aid tools like network analysis, MIS, PERT, CPM.

Reference Books

1. The Politics of Public Health in the United States (2004)
2. The Public Administration Theory Primer (2011)
3. Ethics and Integrity in Public Administration (2009)
4. Social Equity and Public Administration (2010)

Course Code	Foreign Linguistic - French	L	T	P	Credits
1020192102		3	0	0	3

Course Overview:

In this course students get knowledge of active communication in beginning French. including listening, speaking, reading, writing, pronunciation, structure, vocabulary and culture.

Course Objectives:

1. Express him/herself effectively and accurately in simple French about him/herself and pronounce French reasonably well.
2. Construct simple sentences in French using accurate rudiments of syntax and grammar, Time, Weather and Structures used in a restaurant
3. Write short paragraphs on simple topics, e.g., (food, past memories, vacations, daily routines, shopping, health, love and hopes, etc.)
4. Demonstrate an elementary knowledge of French sentence structure while expressing themselves in French.
5. Compare and contrast the similarities and differences between his/her own culture and those of various French-speaking cultures

Course Outcomes:

At the end of the course the student will be able to

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Students have the adequate reading and speaking skills and will be able to express himself in French.	Understanding(L2)	PO-10 PO-12
CO2	Understand the grammar and use them in their personal and professional life.	Understanding (L2)	PO-10 PO-12
CO3	Students will be able to write proficiently in French.	Understanding and applying (L2&L3)	PO-10 PO-12
CO4	Studentswill be able to compare and contrast world culture and it will expand his knowledge about various culture.	Understanding and applying (L2&L3)	PO-6 PO-10 PO-12

UNIT-1 French Alphabet and Typical Sounds in French – I

Recognize the French letters; Pronounce these letters, Identify the differences and similarities between the English and French alphabet Spell one's name and other names in French;   Discover simple words that begin with these letters; Identify the letter-combinations that are characteristic

of the French language; Pronounce these letter-combinations: Recognize the different pronunciations of certain letter-combinations;   Learn the various letter-combinations that produce the same sounds;   Discover simple words that are constructed from these letter-combinations;

UNIT-2 Typical Sounds in French – II,Liaison and Silent Letters

Identify the remaining letter-combinations that are characteristic of the French language; Pronounce these letter-combinations; Combine various letter-combinations to produce a variety of different sounds; Recognize the various accents and diacritical marks used in French; Discover simple words that have these letter-combinations, accents and diacritical marks;   Understand when to pronounce the final consonant;   Recognize when to connect the first and last letters of two adjacently placed words;   Differentiate between a silent 'E' and a pronounced 'E;   Distinguish the difference between a mute 'H' and an aspirated 'H'; Discover simple words that begin with 'H' and those that have silent letters;

UNIT-3 Numbers

Count the numbers from 0 - 100; Write the numbers from 0 – 100 in French; Ask someone his age; Tell one's age and phone number in French;   Distinguish between the formal 'you' and informal 'you';

UNIT-4 Basic Grammar

Pronouns, Verbs, Definite and Indefinite Articles, Adjective, Prepositions, Tenses, Articles Negation, Closed Questions

UNIT-5 Time, Weather and Structures used in a restaurant

Say the time in French; Learn how to say the time in numerals; Learn how to say the time in fractions; Learn how to write the time in French; Learn a few prepositions associated with time; Talk about the weather in French; Use different phrases to express different types of weather conditions; Describe a weather condition in different ways; Understand the difference between French and Native cultures;   Learn the various words and phrases related to weather;Learn the different prepositions used with weather and seasons; Structures used in a restaurant; Place an order in a restaurant; Take an order from a client at a restaurant; Identify the different courses of a meal; Identify basic expressions and structures associated with French gastronomy;   Review partitive articles and expressions of quantity.

BOOKS AND REFERENCES

Alter Ego - Méthode de Français, A1 (2006): Berthet, Hugot et al., Hachette

Alter Ego – Cahier d'activités, A1 (2006): Berthet, Hugot et al., Hachette

Écho - Méthode de Français, A1 (2013): Girardet, Pecheur, CLE International

Écho - Cahier personnel d'apprentissage, A1 (2013): Girardet, Pecheur, CLE International

A votre service – 1, A1 (2011): Chanderasekar, Hanga et al., Hachette

Course Code	Mini Project – 1	L	T	P	Credits
1005192170	**EPICS/Societal relevant project**	**0**	**0**	**2**	**1**

Course Overview:

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

EPICS means **- Engineering Projects In Community Service**

Course Objectives

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

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

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

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

UNIT- I   L: 08

ENGINEER'S CONTRIBUTION TO SOCIETY :
Major roles played by engineers in building a society – Importance of engineers to society – Variousglobal issues, social problems & problems faced by different communities in the world – Engineering inventions which reduced the impact of many social problems.

EPICS:

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

Outcome: Students will be able to understand the importance of Engineers in the society &will also recognize various ways by which engineerscan contribute to society.Students will realize the need of Community projects.

Activity:
- ➢ Visiting a Community / Studying about a community to understand their Problems. Analyzing their problems and Identifying problems which can be solved through technology.
- ➢ Selecting one Social / Community problem from the identified problems to develop a technological solution/project.

UNIT II   L: 08

DESIGN THINKING & PROJECT MANAGEMENT:

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

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

Outcome: Students will be able to understand process of 'Design' for any kind of project. Students will be able to learn the project management techniques. Students will apply this knowledge for developing projects.

Activities:
- ➢ Studying the Design thinking process of Shopping cart developed by IDEO
- ➢ Creating a project plan for the community project.

Unit-III   **L: 10**

PLATFORMS FOR DEVELOPING COMMUNITY PROJECTS:

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

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

Internet of Things (IoT)& Embedded Systems:

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

3D Printing:

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

Thinker CAD:

Thinker CAD circuit making: Circuit Design - Programming – Simulate

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

Mobile App Creation:

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

Web Development:

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

Outcome: Students will be able to learn various platforms and apply the knowledge for developing social projects

Activities:
➢ Based on the requirements of community projects, students will select one or more platforms for project completion. Corresponding online courses will be learnt by students.

Unit-IV   **P: 12**

PROJECT DESIGN& PROTOTYPING:

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

Outcome: Students will be learning the fundamental process of Design. They will learn how to make use of customer requirements to the effective design process and the process of making a prototype.

Activities:

➢ Developing the Community Project

Unit-V   **P: 12**

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

Outcome: Students will be able to learn the importance of testing and redesign in the real time projects.

Activity:
➢ On testing, if results are positive, project needs to be submitted to the community.

Reference Papers:

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

Web links:

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

Course Code	ENVIRONMENTAL SCIENCE	L	T	P	Credits
1000192130	(Audit Course)	2	0	0	0

Course Overview:

Environmental Studies is a specialized course that is meant to train the students in various fields related to the environment like Natural Resources Conversation, Ecology, Environment Impact Assessment, Pollution Management Techniques, and Environmental Protection Laws

Course Objectives:

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

Course Outcomes:

	Course outcome	Blooms Cognitive level	PO
CO1	Gain a higher level of personal involvement and interest in understanding and solving environmental resource problems and its sustainable conservation practices.	Understand	PO 7 ,PO12
CO2	Overall understanding of the relationship between man and ecosystem & biodiversity	Understand	PO 6, PO7,PO 8,PO 9,PO 12
CO3	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century	Understand	PO 2,PO 6,PO 7, PO8, PO9 and PO 12
CO4	Recognize the interconnectedness of human dependence on the earth's ecosystems and Influence their society in proper utilization of goods and services.	Understand	PO 6,PO 7,PO 9 and PO12

Unit-I:
Environmental Science: Definition Scope and its importance, Multidisciplinary nature of Environmental science.

Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, case studies – Energy resources

Unit-I Outcome:
- Learn about the basics of environment, natural resources and its conservation

Activity/Event on Unit-1: Collects the case studies on Natural resources

Unit-II:

ECOSYSTEMS: Concept of an ecosystem. – Structure and function of an ecosystem – Energy flow in the ecosystem – Ecological pyramids - Ecological succession.

BIODIVERSITY AND ITS CONSERVATION: Definition: genetic, species and ecosystem diversity –Value of biodiversity, Threats to biodiversity, –Biodiversity conventions- Conservation of biodiversity.

Unit-II Outcome:
- Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century

Activity/Event on Unit-II: Prepares the models of food chain, web and pyramids

Unit-III:
Social Issues and the Environment
Human population growth: Impacts on environment.– Water conservation, rain water harvesting and watershed management – Resettlement and rehabilitation of people; Case studies Climate change, Global warming, Acid rain, Ozone layer depletion. Environmental laws: Wildlife Protection Act 1972 – Water pollution prevention and control Act 1974 - Forest Conservation Act 1980n –Air pollution prevention and control Act 1981. Environmental Protection Act 1986.

Unit-III Outcome:
- Understand the concept of climate change, its mitigation and environmental legislations
Activity/Event on Unit-III: prepares the models on green house effect and watershed establishmentin the college campus

Unit-IV:
ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of:

1. Air Pollution,
    2. Water pollution,
    3. Soil pollution,
    4. Noise pollution,
    5. Nuclear hazards

SOLID WASTE MANAGEMENT: Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies.

Unit-IV Outcome:

- Understand the harmful effects of human activities on environment and their solution

Activity/Event on Unit-IV: collects case studies on different pollution

Unit-V:
Environmental Management
EIA and EA: Introduction, definition, scope, objectives and methodology. Disaster management: Definition, floods, earthquake, cyclone and landslides. Ecotourism: Definition, advantages and disadvantages Environmental Diary

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

Unit-V Outcome:
Understand the importance of EIA and EA, various disasters and its mitigation measures

Activity/Event on Unit-V: Environmental diary preparation and field trip

Text Books:
1. Text book of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Palaniswamy – Pearson education
3. Environmental Studies by Dr.S.AzeemUnnisa, Academic Publishing Company

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

II Year- II Semester

S.No	Course Code	Name of the Course	L	T	P	Credits
1	1005192220	Advanced Data structures	3	0	3	4.5
2	1005192200	Computer Organization and Architecture	3	1*	0	3
3	1005192221	Database Management Systems	3	0	3	4.5
4	1005192202	Formal Languages and Automata Theory	3	1*	0	3
5	1005192201	Software Engineering	3	0	0	3
6	1000192110	Communication Skills Lab	0	0	2	1
Total Credits :						**19**

Course Code		**L**	**T**	**P**	**Credits**
	ADVANCED DATA STRUCTURES				
1005192220		**3**	**1**	**3**	**4.5**

Course Overview: The purpose of this course is to provide the students with an exploration of advanced data structures (particularly persistent structures) using C. Course reviews main-memory data structures such as hash tables, Graphs and trees. Disk-based structures such as persistent hash tables and dictionaries. Digital Search Structures such as tries.

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

Course Outcomes:

	Course outcome	**Cognitive Level as per Bloom's Taxonomy**	**PO**
CO1	To understand graph representations, Minimum Spanning Trees and traversals	Understanding	PO1, PO2
CO2	Understand dictionaries, hashing mechanism which supports faster retrieval.	Understanding	PO1, PO2
CO3	Implement heaps, queues and their operations, B Trees and B+ Trees	Applying	PO1,PO2,PO3,PO5
CO4	Illustration of tries which share some properties of table look up, various issues related to the design of file structures	Analyzing	PO1,PO2,PO3,PO4

Unit-I:

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 Sollin's Algorithm, Shortest Paths and Transitive Closure, Single Source/All Destination: Nonnegative Edge Cost, Single Source/All Destination: General Weights, All-Pairs Shortest Path, Transitive Closure.

Outcome:
- To understand graph representations, Minimum Spanning Trees and traversals.

Experiment
a) Implement operations on Graphs.

      i. Vertex insertion

      ii. Vertex deletion

      iii. Finding vertex

      iv. Edge addition and deletion

b) To implement Prim's algorithm to generate a min-cost spanning tree.

c) To implement Krushkal's algorithm to generate a min-cost spanning tree.

d) To implement Dijkstra's algorithm to find shortest path in the graph.

e) Implement Depth for Search

f) Implement Breath for Search

Unit-II:

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,

Outcome:
- Understand dictionaries, hashing mechanism which supports faster retrieval.

Experiment
To implementation of Static Hashing (Use Linear probing for collision resolution)

To implement of Huffman coding.

Unit-III:

PRIORITY QUEUES AND EFFICIENT BINARY SEARCH TREES:
Priority Queue ADT, Model, Simple Implementation, Binary Heap, Applications of Priority Queues- The Selection Problem Event Simulation Problem, Binomial Queues- Binomial Queue Structure – Binomial Queue Operation- Implementation of Binomial Queues
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, Splay Trees.

Outcome:
- Comprehension of heaps, queues and their operations
- Illustration of Balanced trees and their operations

Experiment

To perform various operations i.e., insertions and deletions on AVL trees.

To Implement Red Black Trees

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.

Outcome: Incorporate data structures into the applications such as B Trees and B+ Trees
Experiment
To implement of B-tree.

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, Tries and Internet Packet Forwarding ,-IP Routing- 1-Bit Tries- Fixed-Stride Tries-Variable-Stride Tries.

Outcome: Illustration of tries which share some properties of table look up, various issues related to the design of file structures

Experiment
Construct Tries for the implementation of English Dictionary and Perform Searching of a word in dictionary.

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. Web : http://lcm.csa.iisc.ernet.in/dsa/dsa.html
2. http://utubersity.com/?page_id=878
3. http://freevideolectures.com/Course/2519/C-Programming-and-Data- Structures
4. http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms
5. File Structures :An Object oriented approach with C++, 3rded, Michel J Folk, Greg Riccardi, Bill Zoellick
6. C and Data Structures: A Snap Shot oriented Treatise with Live examples from Science and Engineering, NB Venkateswarlu& EV Prasad, S Chand, 2010.

Course Code	**COMPUTERORGANIZATIONAND ARCHITECTURE**	L	T	P	Credits
1005192200		3	1	0	3

Course Overview: This course is intended to give you a basic understanding of how computers execute programs. Understanding computers means understanding the hardware/software process of how you and the computer work together to have the computer carry out a task. In this course, building will not mean connecting chips and gates. Rather, you will describe the hardware in diagrams, finite-state machines, and hardware simulators.

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

Course Outcomes:

	Course outcome	**Cognitive Level as per Bloom's Taxonomy**	**PO**
CO1	To conceptualize the basics of organizational and architectural issues of a digital computer and to perform computer arithmetic operations.	Understanding	PO1,PO2
CO2	To analyze performance issues in processor and can calculate the effective address of an operand by addressing modes.	Analyzing	PO1,PO2,PO3,PPO4
CO3	Ability to design memory organization that uses banks for different word size operations to understand the concept of cache memory techniques	Applying	PO1,PO2,PO3,PPO4,PO5
CO4	Understand the concept of Input / Output organization.	Understanding	PO1,PO2

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.

Outcome: To conceptualize the basics of organizational and architectural issues of a digital computer and to perform computer arithmetic operations.

Activity: Outline the characteristics of any computer architecture.

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, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt.

Outcome: To understand the concept of Input / Output organization.

Activity: Design a logic circuit for an arithmetic operation

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, CISC Characteristics, RISC Characteristics.   Introduction to Parallel Processing, Pipelining – General Considerations.

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

Outcome: To analyze performance issues in processor and can calculate the effective address of an operand by addressing modes.

Activity: Interpret any instruction and write various instruction formats.

Unit-IV:

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

Outcome: Understand the concept of various memory organizations

Activity: Analyse the memory organization of your system and list the system configuration.

Unit-V:

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access. Multi Processors: Introduction, Characteristics of Multiprocessors, Interconnection Structures, Inter Processor Arbitration.

Outcome: Understand various data transfer mechanisms

Activity: Attend a webinar and write a report on input -output organization

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, - SivaRaamaDandamudi Springer Int. Edition.
4. "Computer Organization and Design: The Hardware/Software Interface" by David A. Patterson and John L. Hennessy

Course Code	**DATABASE MANAGEMENT SYSTEMS**	L	T	P	Credits
1005192221		3	1	3	4.5

Course Overview: This course introduces database design and creation using a DBMS product. Emphasis is on data dictionaries, normalization, data integrity, data modelling, and creation of simple tables, queries, reports, and forms. Upon completion, students should be able to design and implement normalized database structures by creating simple database tables, queries, reports, and forms.

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

Course Outcomes:

	Course outcome	**Cognitive Level as per Bloom's Taxonomy**	**PO**
CO1	Describe ER model and normalization f or database design.	Analyzing	PO1, PO2, PO4
CO2	Create, maintain and manipulate a relational database using SQL	Applying	PO1,PO2,PO4,PO5
CO3	Design and build database system for a given real world problem	Applying	PO1,PO2,PO4,PO5
CO4	Examine issues in data storage and query processing and can formulate appropriate solutions.	Understand	PO1, PO2

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

Outcome: After Completion of the Unit, Student will Be able to:
1. Describe the Architecture of Database Management Systems
2. Design different ER Models
3. Understand the applications of dbms,difference between filesystems vs dbms, identify the data models ,understand dbms structure

Activity: Draw ER Diagram for Various Real Time Systems.

Unit-II:
Relational model: Introduction to the Relational Model, Relational model constraints over relations. Relational Algebra and calculus

Outcome: After Completion of the Unit, Student will Be able to:
1. To differentiate the knowledge in TRC & DRC
2. Compare relational model with the structured query language (SQL)
3. Understands the relational algebra concepts, selection ,projection ,relational calculus which helps in understanding queries

Activity: Tabulate Various Relational Modelsfor Real Time Application.

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

Outcome: After Completion of the Unit, Student will Be able to:
1. Design the new database.
2. Master the basic concepts and appreciate the applications of database systems.
3. Master the basics of SQL and construct queries using SQL.

Activity: Design a new Database and normalize the data

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.

Outcome: After Completion of the Unit, Student will Be able to:
1. Differentiate different indexing techniques in real time.
2. An ability to use and apply current technical concepts and practices in the coreinformation technologies.
3. Be familiar with a commercial relational database system (Oracle) by writing SQLusing the system.
4. Be familiar with the relational database theory, and be able to Write relational algebraexpressions for queries

Activity: Create your own data base and connect the front-End and back-End

Unit-V: Query processing, Transaction Management, Concurrency Control and
Crash recovery Transactions: Acid Properties of Transaction - Transaction States
- Schedule: Serial Schedule - 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

Outcome: After Completion of the Unit, Student will Be able to:
1. Make us of transactions for new concepts.
2. Understands the properties of transaction management.
3. Master the basics of query evaluation techniques and query optimization.
4. Be familiar with the basic issues of transaction processing and concurrency control

Activity: Perform Transaction on Various Real Time Concepts.

LIST OF EXPERIMENTS:

1) Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.

2) Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints.

Example:- Select the roll number and name of the student who secured fourth rank in the class.

3) Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.

4) Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), datefunctions(Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc,round, to_char, to_date)

5) Creation of simple PL/SQL program which includes declaration section, executable sectionand exception –Handling section (Ex. Student marks can be selected from the table andprinted for those who secured first class and an exception can be raised if no records werefound).

6) Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT inPL/SQL block.

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.

8) Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops usingERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATIONERROR.

9) Programs development using creation of procedures, passing parameters IN and OUT ofPROCEDURES.

10) Program development using creation of stored functions, invoke functions in SQLStatements and write complex functions.

11) Program development using creation of package specification, package bodies,

privateobjects, package variables and cursors and calling stored packages.

12) Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR,WHERE CURRENT of clause and CURSOR variables.

13) Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggersand INSTEAD OF Triggers.

Text Books:
1. Database System Concepts. 6/e Silberschatz, Korth, TMH
2. Database Management Systems, 3/e Raghuram Krishnan, Johannes Gehrke, TMH
3. 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.

Course Code	FORMAL LANGUAGES AND AUTOMATA THEORY	L	T	P	Credits
1005192202		3	1	0	3

Course Overview: The course introduces some fundamental concepts in automata theory and formal languages including grammar, finite automaton, regular expression, formal language, pushdown automaton, and Turing machine. Not only do they form basic models of computation, they are also the foundation of many branches of computer science, e.g. compilers, software engineering, concurrent systems, etc. The properties of these models will be studied and various rigorous techniques for analysing and comparing them will be discussed, by using both formalism and examples.

Course Objectives:
- Introduce the student to the concepts of Theory of computation in computer science
- The students should acquire insights into the relationship among formal languages, formal Grammars and automata.

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Employ finite state machines to solve problems in computing	Analyzing	PO1, PO2, PO4
CO2	Classify machines by their power to recognize languages	Understanding	PO1, PO2
CO3	To Design PDA for solving computational Problems	Applying	PO1, PO2, PO3
CO4	To design Turing Machine for arithmetic Operations	Applying	PO1, PO2, PO4

Unit-I:

Computation, Finite State Machine, Components of Finite State Automata, Elements of Finite State System, Mathematical representation of Finite State Machine Formal Language Theory-Symbols, Alphabets and Strings, Operations on Strings, Formal Languages, Operations on Languages, types f formal languages,Finite Automata: Introduction, Deterministic Finite Automata(DFA), Design of DFAs, Non Deterministic Finite Automata(NFA),

Outcome:
- Classify machines by their power to recognize languages,
- Employ finite state machines to solve problems in computing,

Activity: Design a DFA For real world problems

Unit-II: Non-Deterministic Automata with Є-moves , Design of NFA- Є s, NFA Versus DFA,
Equivalent Automata: Equivalent Finite-State Automata, Equivalence of NFA/NFA- and DFA,Equivalence of NFA, with Є moves to NFA, without Є - moves.Minimization/ Optimization of DFA.

Transducers: Moore Machine, Mealy Machine, Difference between Moore and Mealy Machines, Properties / Equivalence of Moore and Mealy Machines.

Outcome:
- Explain deterministic and non-deterministic machines,

Activity: Develop a transducer for real world problem.

Unit-III:
Regular Expressions and Languages: Regular languages, Regular expressions, Properties of Regular Expressions, Uses of Regular Expressions, Finite Automata and Regular Expressions: Properties of Regular Sets and Regular Languages, Arden's Theorem, Equivalence of Finite Automata and Regular Expressions, Equivalence of DFA and Regular Expression, Equivalence of NFA and Regular Expression,
Types of Grammar, Ambiguous and Unambiguous Grammars, Noam Chomsky's Classification of Grammar and Finite Automata, Relation between Regular Grammar and Finite Automata.

Outcome: Classify machines by their power to recognize languages Explain the power and the limitations of regular languages and Lexical Analysis

Activity: Construct a minimized DFA for a regular expression

Unit-IV: Context-Free Grammars and Context-Free Languages: Simplification of Context – Free Grammar: Simplification of Context-Free Grammars, Elimination of Є -Productions, Elimination of Unit Productions, Normal Forms for Context Free Grammars, Chomsky Normal Form, Greibach Normal Form.
PDA: Definition of PDA and Design of PDA, types of PDA

Outcome:
- Able to identify, understand and construct various parsing techniques for a given context free grammars.

Activity: Demonstrate how a strings are accepted by PDA

Unit-V:

Turing Machine: Introduction, Components of Turing Machine, Description of Turing Machine, Elements of TM, Moves of a TM, Language accepted by a TM, Role of TM's , Design of TM's, TM Extensions and Languages:
TM Languages, Undecidable Problem, P and NP Classes of Languages

Outcome: Comprehend the hierarchy of problems arising in the computer science

Activity: Design a Turing machine for arthematic operations.

Text Books:

1. Elements of Theory of Computation, Harry R Lewis, Papadimitriou, PHI
2. Introduction to theory of computation, 2nd ed, Michel sipser, CENGAGE
3. A Text Book on Automata Theory, Nasir S.F.B, P.K. Srimani, Cambridge university Press
4. Introduction to Automata Theory, Formal languages and computation, Shamalendukandar, Pearson

Reference Books:

1. Formal Languages and automata theory, C.K. Nagpal, OXFORD
2. Theory of Computation , aproblem solving approach, kavi Mahesh, Wiley
3. Automata, computability and complexity, Theory and applications, Elaine rich, PEARSON
4. Theory of Computation, Vivekkulkarni, OXFORDAttachments area
5. Introduction to Automata Theory, Languages and Computation, J.E.Hopcroft, R.MotwaniAnd J.D.Ullman, 3rd Edition, Pearson, 2008.

Course Code	SOFTWARE ENGINEERING	L	T	P	Credits
1005192201		3	1	0	3

Course Overview: Software engineering is a branch associated with development of software product using well-defined scientific principles, methods and procedures. The outcome of software engineering is an efficient and reliable software product. Software project management has wider scope than software engineering process as it involves communication, pre and post delivery support etc.

Course Objectives:
- To understand the software life cycle models.
- To understand the software requirements and SRS document.
- To understand the importance of modelling and modelling languages.
- To design and develop correct and robust software products.
- To understand the quality control and how to ensure good quality software.
- To understand the planning and estimation of software projects.
- To understand the implementation issues, validation and verification procedures.
- To understand the maintenance of software

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Apply the appropriate process models for the application development of SDLC	Applying	PO1, PO2, PO3, PO5
CO2	Understand the phases of SDLC from requirement gathering phase to design phase via Analysis Phase	Understanding	PO1,PO2
CO3	Analyzing the strategies for coding and testing phase in Software product development	Analyzing	PO1,PO2,PO3
CO4	Apply the knowledge about estimation and maintenance of software systems and modeling the software project by using CASE tools	Applying	PO1, PO2, PO3, PO5

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: A Generic Process Model like Waterfall Models, Agile Model etc. Process Assessment and Improvement, PrescriptiveProcess Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Terminology, Product and Process.

Outcome:
- Define and develop a software project from requirement gathering to implementation.

Activity: For a given problem which process model is suitable justify that.

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

Outcome:
- Define and develop a software project from requirement gathering to implementation.

Activity: Do the Requirement Analysis and Prepare SRS for a project

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 UserInterfaces, Fundamentals of Component-based GUI Development, A User Interface Design Methodology.

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

Outcome: Obtain knowledge about principles and practices of software engineering.

Activity: Draw E-R diagrams, DFD, CFD and structured charts for the project

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 Supportin Software Life Cycle, Other Characteristics of Case Tools, Towards Second Generation CASE Tool, Architecture of a Case Environment

Outcome: Focus on the fundamentals of modelling a software project.

Activity: Design of Test cases based on requirements and design.

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.

Outcome: Obtain knowledge about estimation and maintenance of software systems

Activity: Using COCOMO model estimate effort for a project.

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

Reference Books:
1. Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008
2. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
3. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
4. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition, 2006.

Course Code		L	T	P	Credits
	COMMUNICATION SKILLS LAB				
1000192110		0	0	2	1

Course Overview: In this course will develop the English proficiency of students and enable them to function effectively in different professional contexts, which enhances their employability skills.

Course Objectives:

To impart employability skills like resume preparation and facing interviews
To enable trainees to develop interpersonal and leadership skills
To train them on work place skills like making presentations, participating in group discussions etc

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Analyze the functions of language and grammar in spoken and written forms with an emphasis on LSRW Skills.	Analyze	PO5,PO10,PO12
CO2	Disseminate the relevant skills while performing GDs, interviews, oral presentations with a focus on Non verbal communication.	Understanding	PO5,PO10,PO12
CO3	Prepare and exhibit oral presentation skills by using ICT.(Individual/Team)	Analyzing	PO5,PO10,PO12
CO4	Organize proper life skills for their employability.	Applying	PO5,PO10,PO12

Experiments:

Expt.1: JAM (Just A Minute)

Expt.2: Interactions

Expt.3: Group Discussion

Expt.4: Reading Comprehension

Expt.5: Listening Comprehension

Expt.6: Presentation Skills

Expt.7: Resume Preparation and Covering Letter

Expt.8: Mock Interviews

Reference Books:

- Edward Holffman, **Ace the corporate personality**, McGraw Hill,2001
- Adrian Furnham, **Personality and intelligence at work**, Psychology Press, 2008.
- John Adair Kegan Page, "**Leadership for innovation"** 1st edition, Kogan, 2007.
- Krishna Mohan & NP Singh, "**Speaking English effectively"** 1st edition, Macmillan, 2008.
- Dr. S.P. Dhanvel**, English and Soft skills,** Orient Blackswan, 2011
- Rajiv K. Mishra, Personality **Development**, Rupa& Co. 2004.

III Year - I Semester

S. No.	Course Code	Course Title	L	T	P	C
1	1005193120	Web Technologies	3	0	3	4.5
2	1005193100	Design and Analysis of Algorithms	3	0	0	3
3	1005193101	Data Warehousing and Data Mining	3	0	0	3
4	1005193102	Operating Systems	3	0	0	3
5	**Professional Elective-I**		3	0	0	3
	1005193150	a) Programming Essentials in Python				
	1005193151	b) Industrial Oriented Python Programming				
	1005193152	c) Unix and Shell Programming				
	1005193153	d) Computer Graphics				
	1005193154	e) Advanced Computer Architecture				
6	**Open Elective-II**		3	0	0	3
	1001193160	a)Industrial Waste Water Engineering				
	1002193160	b) Solar Photovoltaic Energy				
	1002192201	c) Power Generation				
	1003193160	d) Industrial Robotics				
	1003193161	e) Green Engineering Systems				
	1003193162	f) Mechatronics				
	1003193163	g) Operations Research				
	1004193160	h) Data Communications				
	1004193161	i) Signal Processing				
7	1005193110	Python Programming Lab	0	0	3	1.5
8	1099193130	Professional Ethics & Human Values	2	0	0	0
Total Credits						**21**

Course Code	WEB TECHNOLOGIES	L	T	P	Credits
1005193120		3	0	3	4.5

Course Overview:
This course is designed to start a path toward future studies in web development and design. By the end of this course student can able to describe the structure and functionality of the world wide web, create dynamic web pages using a combination of HTML, CSS, and JavaScript, apply essential programming language concepts.

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	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Understand HTML tags to design static web pages	Understand	PO1
CO2	Describe the basic concepts of Java Scripts to design dynamic web pages	Understand	PO1, PO2
CO3	Familiarize the concepts of PHP and AJAX	Analyze	PO2, PO3, PO11, PO12
CO4	Analyze a given problem and apply requisite appropriate tools for designing dynamic and interactive web applications	Understand & Apply	PO2, PO3, PO11, PO12

UNIT- I:

Introduction to HTML : Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Forms, HTML5
CSS: Levels of Style Sheets, Style Specification Formats, Selector Forms, The Box Model, Conflict Resolution

Outcome: Understand HTML tags to design static web pages

Activity:
1.Design Web page to illustrate the following for Educational Institution
- Home Page
- Login Page
- Registration page
2. Design Web page to illustrate the following for Educational Institution
- Departments
- Faculty Details
- Student personal Info
- Placement and Staff Details
3. Design Web page to illustrate the following for Educational Institution
- Student Academic Info

- Training and Placement details
- Student Chapters

UNIT -II:

The Basic of Java script: Objects, Primitives Operations and Expressions, Screen Output and Keyboard Input, Control Statements, Object Creation and Modification, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions DHTML: Positioning Moving and Changing Elements

Outcome: Describe the basic concepts of Java Scripts to design dynamic web pages

Activity:

1.Login page has username and password fields along with submit button, forgot password and sign up hyperlinks.

2. Perform form validation using Java Script for Login and Registration forms using regular expressions.

UNIT- III:

Introduction to XML, Document Type Definition, XML namespaces, XML SCHEMA Document object model, XML parsers, XSLT , DOM VS SAX, sample XML Documents

Outcome: Familiarize the concepts of XML and AJAX

Activity:

1.Write an XML file which will display the Student personal information which includes the Book Information Fields.

2. Write an XML Schema and DTD file which will display the Student personal information which includes the Book Information Fields.

UNIT- IV:

PHP Programming: Introducing PHP: Creating PHP script, Running PHP script. Working with variables and constants: Using variables, Using constants, Data types, Operators. Controlling program flow: Conditional statements, Control statements, Arrays, functions. Working with forms and Databases such as MySQL

Outcome:
1. Familiarize the concepts of PHP.
2. Design the server side dynamic web application

Activity:

1. Implement PHP different arrays and Functions.

2. Establish Mysql Connection using PHP for Login form

3. Write a PHP to connect to the database, Insert the details of the student academic information with student academic info page.

UNIT -V:

Node JS: Introduction,Node js - Basics and Setup, Node js Console, Node js Command Utilities, Node js Modules, Node js Concepts, Node js Events .

Outcome: Familiarize the concepts of Node js.

Activity:

1.Setup Node.js Development Environment, Run sample console programs.

2. Create different modules using Node JS.

TEXT BOOKS

1. HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery, 2ed
2. React. Js Book: Learning React JavaScript Library from Scratch, Book by Greg Sidelnikov
3. Node.js in Action, by Alex Young , Bradley Meck , Mike Cantelon , Tim Oxley , Marc Harter , T.J. Holowaychuk , Nathan Rajlich

REFERENCE BOOK

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

Course Code	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	Credits
1005193100		3	0	0	3

Course Overview:
This course introduces different techniques to design algorithms using Divide and Conquer, Greedy Approach, Dynamic Programming, Randomized techniques, Multi-Threading, Backtracking and Branch and Bound. It also focuses on how to measure the time and space complexities of algorithms.

Course Objectives:
1. Explains how to design and analyse algorithms for problems.
2. Discusses on how to measure the performance of algorithms.
3. Improving perspective of the students while devising algorithms for new problems.

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Able to analyze the performance of an algorithm in terms of time and space.	Understanding	PO1
CO2	Give an intuition on how to find a solution to large problems by dividing them into smaller sub problems.	Understanding	PO1, PO2
CO3	Identifying which designing technique can be used to solve a particular problem.	Applying	PO3, PO4
CO4	Able to analyse the complexities between naïve and parallel algorithms	Analysing	PO1,PO2, PO3, PO4

UNIT- I:
Foundations of Algorithm: Algorithm, Algorithm Specification, Recursive Algorithm, **Analysis:** Space Complexity and Time Complexity, Asymptotic Notations, Amortized Analysis, **Sorting in linear time:** Counting sort

Outcome: After reading this Unit, student should be able to understand:
- Analyze algorithm complexities in terms of time and space.
- Illustrate the differences between recursive and non-recursive algorithms.
- Analyze aggregate and accounting methods using amortized analysis.

Activity:
1. For a set of basic problems, students have to develop programs and provide complexity analysis.

UNIT -II:
Divide and Conquer: General method, Masters Theorem with proof, Applications: Binary search,

Defective Chessboard, Finding the Maximum and Minimum, Quick sort, Merge sort, Matrix multiplication: Block and Strassen's matrix multiplication, Randomized Quicksort.

Outcome: After reading this Unit, student should be able to understand:
1. For what kind of problems Divide-and-Conquer can be applied.
2. Using Masters Theorem to find the complexities.
3. Illustrate the difference between substitution and Masters Theorem for finding time complexities.
4. Various types of divide-and-conquer applications.

Activity:
1. Develop programs for all the algorithms under divide-and-conquer technique.

UNIT- III:

Greedy method: General method, Applications: Job sequencing with deadlines, knapsack problem, Single source shortest path problem, Optimal Merge Patterns.
Multithreaded Algorithms: Basics of dynamic multithreading, multithreaded matrix multiplication, multithreaded merge sort.

Outcome: After reading this Unit, student should be able to understand:
1. For what kind of problems a greedy approach can be applied.
2. Choosing greedy method to get an optimal solution.
3. Estimate the algorithms to speed up and amount of work done using multithreaded concepts.
4. Various types of greedy method applications.

Activity:
1. Develop optimized programs for all the algorithms under greedy method and multithreaded algorithms.

UNIT- IV:

Dynamic Programming: General method, Applications: Matrix chain multiplication, 0/1 knapsack problem, All pairs shortest path problem, Travelling salesperson problem, String Editing, Reliability design.

Outcome: After reading this Unit, student should be able to understand:
1. Applying principle of optimality to get an optimal solution.
2. Various types of dynamic programming applications.
3. Illustrate the difference between greedy and dynamic programming in getting optimal solution

Activity:
1. Develop programs for a set of problems using dynamic programming.

UNIT -V:

Backtracking: General method, Applications: n-queen problem, sum of subsets problem.
Branch and Bound: Control Abstraction for LC-Search, FIFO & LIFO Branch-and-Bound techniques, 15-Puzzle Problem.
Introduction to NP-Hard and NP- Completeness.

Outcome: After reading this Unit, student should be able to understand:

1. Exploring a solution space using backtracking technique.
2. Develop an intuition on what kind of problems can be solved with branch-and-bound technique.
3. Illustrate differences between backtracking and branch-and-bound methods.
4. How a problems can be classified in to either P-class or NP-class.

Activity:

1. Generate all possible outcomes for a given problem either by using backtracking and branch-and-bound.

TEXT BOOKS

1. Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahni and Rajasekharam, Universities Press.
2. Introduction to Algorithms, second edition, T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein, PHI Pvt. Ltd.
3. The Algorithm Design Manual, 2nd edition, Steven S. Skiena, Springer.
4. Design and Analysis of Algorithms, S. Sridhar, OXFORD UNIVERSITY PRESS.
5. Introduction to the Design and Analysis of Algorithms, Anany Levi, PEA

REFERENCE BOOK

1. Design and Analysis of Computer Algorithms, First Edition, V. AHO, Pearson
2. Design and Analysis of Algorithms, Parag Himanshu Dave, HimansuBalachandra Dave, Pearson Education.
3. Introduction to Design and Analysis of Algorithms A strategic approach, R.C.T. Lee, S.S.Tseng, R.C.Chang and T.Tsai, Mc GrawHill.
4. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
5. Algorithms: Fourth Edition, Robert Sedgewick, Addison-Wesley, 2008

E-Books:

1. https://kailash392.files.wordpress.com/2019/02/fundamentalsof-computer-algorithms-by-ellis-horowitz.pdf
2. https://web.ist.utl.pt/~fabio.ferreira/material/asa/clrs.pdf

NPTEL/MOOC: (Specify Links)

1. https://nptel.ac.in/courses/106/106/106106131/
2. https://nptel.ac.in/courses/106/101/106101060/

Course Code	DATA WAREHOUSING AND DATA MINING	L	T	P	Credits
1005193101		3	0	0	3

Course Overview:

This course discusses techniques for pre-processing data before mining and presents the concepts related to data warehousing, online analytical processing (OLAP), and data generalization. It presents methods for mining frequent patterns, associations, and correlations. It also presents methods for data classification and prediction, data-clustering approaches, and outlier analysis.

Course Objectives:
1. To understand data warehouse and data mining concepts, architecture, business analysis and tools
2. To understand data pre-processing and data visualization techniques
3. To study algorithms for finding hidden and interesting patterns in data
4. To understand and apply various classification and clustering techniques on real-time data

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Understand the concepts of data warehouse and data mining	Understand	PO-1, PO-2, PO-12
CO2	Use data pre processing techniques to build data warehouse	Apply	PO-1, PO-2, PO-3
CO3	Analyze transaction databases for association rules	Analyze	PO-1, PO-2, PO-3, PO-4, PO-10
CO4	Understand the details of different algorithms made available by popular commercial data mining software and Solve real data mining problems by using the right tools to find interesting patterns	Evaluate	PO-1, PO-2, PO-3, PO-5, PO-10

UNIT- I:

Introduction: What Motivated Data Mining? Why Is It Important? Knowledge Discovery Process, Data Mining—On What Kind of Data, Data Mining Functionalities—What Kinds of Patterns Can Be Mined? Classification of Data Mining Systems, Data Mining Task Primitives, Major Issues in Data Mining.

Data Pre-processing: Why Pre-process the Data? Data Cleaning, Data Integration, Data Transformation, Data Reduction and Data Discretization.

Outcome: After reading this Unit, student should be able to:

- Illustrate how does Data warehouse help in improving the business of an organization.
- Organize and prepare the data needed for data mining using preprocessing techniques.
- Perform exploratory analysis of the data to be used for mining.

Activity/Event:

1. Illustrate how Data warehouses help in improving the business of an organization.
2. Discuss various steps and approaches for data cleaning.

UNIT-II:
Data Warehouse and OLAP Technology: An Overview: What Is a Data Warehouse? OLAP versus OLTP, A Multidimensional Data Model- Data Warehouse Schemas, Concept Hierarchies, Typical OLAP Operations, Data Warehouse Architecture, Data Warehouse Implementation.

Outcome: Ability to understand why there is a need for data warehouse in addition to traditional operational database systems and identify components in typical data warehouse architecture.
Activity/Event: Briefly compare the following concepts. You may use an example to explain your point(s).
(a) Star schema, Snowflake schema and fact constellation
(b) Enterprise warehouse, data mart and virtual warehouse.

UNIT-III:
Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Working of Decision Tree, Building a decision tree, Methods for expressing an attribute test conditions, Measures for selecting the best split, Algorithm for decision tree induction. Model Over fitting: Due to presence of noise, Due to lack of representation samples, Evaluating the performance of classifier: holdout method, random sub sampling, and cross-validation, bootstrap.

Outcome: To make students well versed in all data mining algorithms, methods of evaluation.
Activity/Event: Implement the Decision Tree Induction algorithm and find the best splitting attribute.

UNIT-IV:
Association Analysis: Basic Concepts, Frequent Itemset Mining Methods - Apriori Algorithm, Frequent-Pattern Growth Approach, Generating Association Rules from Frequent Itemsets. Mining various kinds of Association rules.

Outcome: To make students well versed in all data mining algorithms, methods of evaluation.
Activity/Event: Implement the Decision Tree Induction algorithm and find the best splitting attribute.

UNIT-V:
Cluster Analysis: What Is Cluster Analysis? Different Types of Clusterings, Different Types of Clusters, K-means: The Basic K-means Algorithm, K-means additional Issues, Bisecting K-means, K-means and Different Types of Clusters, Strengths and Weaknesses. Hierarchical Clustering: Agglomerative and Divisive Hierarchical Clustering algorithms, Strengths and Weaknesses of Hierarchical Clustering.
DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses.

Outcome:
- Define and apply metrics to measure the performance of various data mining algorithms.
- Compare and analyze the implementation of different clustering algorithms.

Activity/Event: Generalize each of the following clustering algorithms in terms of the following criteria: (i) shapes of clusters that can be determined; (ii) input parameters that must be specified; and (iii) limitations.

(a) k-means
(b) DBSCAN

TEXT BOOKS

1. Data Mining concepts and Techniques, 3/e, Jiawei Han, Michel Kamber, Elsevier.
2. Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Pearson.

REFERENCE BOOKS

1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning.
2. Data Mining : Introductory and Advanced topics : Dunham, Pearson.
3. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH.

E-Books:

1. https://www.academia.edu/6489220/Data_Mining_ebook
2. http://myweb.sabanciuniv.edu/rdehkharghani/files/2016/02/The-Morgan-Kaufmann-Series-in-Data-Management-Systems-Jiawei-Han-Micheline-Kamber-Jian-Pei-Data-Mining.-Concepts-and-Techniques-3rd-Edition-Morgan-Kaufmann-2011.pdf

Course Code	OPERATING SYSTEMS	L	T	P	Credits
1005193102		3	0	0	3

Course Overview:

This course will introduce the core concepts of operating systems, such as processes and threads, scheduling, synchronization, memory management, file systems, input and output device management and security.

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	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO's Mapped
CO1	Summarize various concepts of Operating Systems	Understanding	PO1, PO2
CO2	Implement and Apply Process Scheduling Algorithms	Applying	PO1, PO2, PO4,PO5
CO3	Illustrate concepts of Paging, Segmentation and Apply Concurrency, Deadlock Mechanisms in real world	Applying	PO1, PO2, PO3
CO4	Analyze the concepts of file systems in operating systems	Analyzing	PO1, PO3, PO12

UNIT- I:

Introduction to Operating System Concept: Types of operating systems, operating systems concepts, operating systems services, Introduction to System call, System call types.

Outcome: After reading this Unit, student should be able to:

1. Define Operating System and describe types of Operating Systems

Activity: Brainstorming method.

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

Outcome: After reading this Unit, student should be able to:

1. Define the concept of process and apply process scheduling algorithms.

Activity: Problem solving related to CPU Scheduling algorithms.

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.

Outcome: After reading this Unit, student should be able to:
1. Illustrate the concept of Paging and Segmentation.
Activity: Visualization of concepts using model charts

UNIT- IV:
Process Synchronization, The Critical- Section Problem, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization Examples
Principles of deadlock:
System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery form Deadlock

Outcome: After reading this Unit, student should be able to:
1. Apply the concept of Concurrency to real world problems
Activity: Role play related to classic problems of synchronization

UNIT -V:
File system Interface:
The concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection. File System implementation- File system structure, allocation methods, free-space management Mass-storage structure overview of Mass-storage structure, Disk scheduling, Device drivers. Introduction to Dockers.

Outcome: After reading this Unit, student should be able to:
1. Design and Implement a prototype file systems
Activity: Seminar method

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

REFERENCE BOOK
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, TataMcGraw-Hill Education, 2007.

Course Code	PROFESSIONAL ELECTIVES 1 Programming Essentials in Python	L	T	P	Credits
1005193150		3	0	0	3

Course Overview:
This course introduces computer programming using the Python programming language which will help you to master the Programming with Python by introducing the Object Oriented programming concepts, creation of Data Structures, Implementation of Functions, and Visualization libraries. Lastly you will get into design, code, test, and debug Python programming Language Scripts.

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:	Cognitive Level as per Bloom's Taxonomy	POs Mapped
CO1	Develop essential programming skills in computer programming concepts like data types, containers	Understand	PO1
CO2	Apply the basics of programming in the Python language	Understand	PO1, PO2
CO3	Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming.	Applying	PO5
CO4	Solve coding tasks related OOPS, and Multithreading	Analyzing	PO12

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

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.

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   .

UNIT- IV: INTRODUCTIONS 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

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

TEXT BOOKS

1. ReemaThareja,"Python ProgrammingUsing Problem Solving Approach", Oxford University Press,2019.
1. Zed Shah, "Learn PythonThe Hard Way", Third edition, Addison-Wesley, 2013.

REFERENCE BOOK

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:

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

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

Course Code	PROFESSIONAL ELECTIVES 1	L	T	P	Credits
1005193151	**Industrial Oriented Python Programming**	3	0	0	3

Course Overview:

This course introduces computer programming using the Python programming language which will help you to master the Programming with Python by introducing the Object Oriented programming concepts, creation of Data Structures, Implementation of Functions, and Visualization libraries. Lastly you will get into design, code, test, and debug Python programming Language Scripts.

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:	Cognitive Level as per Bloom's Taxonomy	POs Mapped
CO1	Develop essential programming skills in computer programming concepts like data types, containers	Understand	PO1
CO2	Apply the basics of programming in the Python language	Understand	PO1, PO2
CO3	Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming.	Applying	PO5
CO4	Solve coding tasks related OOPS, and Multithreading	Analyzing	PO12

UNIT- I:
INTRODUCTION TO PYTHON

Introduction: History of Python, Need of Python Programming, Variables, 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.

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.

UNIT- III:

FUNCTIONSANDOOPS

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.

Classes and Objects: Introduction, classes and objects, class method and self-argument, init() method, classand object variables ,public and private data members, private methods, calling a class method from another class method, built-in class attributesclass andstatic methods, Inheritance: Introduction, inheriting classes in python, types of inheritance.

UNIT- IV:

Permutations and combinations of list, Pow(x,n) in log n, Modulo arithmetic - maximum subarray sum modulo M, Factorization - number of factors, sum of factors , nCr mod M using Fermat little theorem, Sieve of erasthones, GCD in logN, Nth Fibonacci number using matrix exponentiation, Binary search - Aggressive cows(SPOJ), Disjoin set union, String matching - KMP, Stack - Next greater element, Priority queue - Merge K sorted arrays, Median in running stream of integers.

UNIT -V:

Dynamic Programming: Dynamic Programming strategies, understanding DPapproaches One dimensional DP- Maximum value contiguous subsequence ,Maximum sum subarray with constraint, House Robbing , SSS restaurants , Gas stations, Rod cutting problem, Longest increasing subsequence [LIS] with constraint , Building bridges, Finding optimal number of jumps, Frog river crossing.(Textbook -2)

Two dimensional DP: Climbing n stairs with taking only 1, 2 or 3 steps, Longest common subsequence, Computing a binomial coefficient: n choose k , Painting colony houses with k colors, Counting Boolean parenthesizations, Edit distance, Apple count, Apple count variant with 3 ways of reaching a location, Maximum size sub-matrix with all 1's, Bombing enemies.(Textbook-2).

TEXT BOOKS

 1. ReemaThareja, "Python ProgrammingUsing Problem Solving Approach", Oxford   University Press,2019.

 2. Karumanchi, Narasimha. Algorithm Design Techniques: Recursion, Backtracking,   Greedy, Divide and Conquer, and Dynamic Programming. India, CareerMonk   Publications, 2018.

REFERENCE BOOK

 1. Charles Severance, " Python for Informatics- Exploring Information", 1st edition   Shroff Publishers,2017.

 2. Guide to Competitive Programming: Learning and Improving Algorithms Through   Contests (Undergraduate Topics in Computer Science)

 3. Competitive Programming in Python: 128 Algorithms to Develop Your Coding Skills Book   by Christoph Dürr and Jill-Jênn Vie

 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:

1. https://www.python.org/doc/

NPTEL/MOOC:

1. https://cses.fi/book/index.php
2. Leetcode.com

1. https://www.python.org/doc/

Course Code	PROFESSIONAL ELECTIVES 1 UNIX AND SHELL PROGRAMMING	L	T	P	Credits
1005193152		3	0	0	3

Course Overview:

In this course you learn about UNIX operating system commands and utilities, navigating through the UNIX file systems and to work with files, directories, and permissions, regular expressions to create powerful search strings, also to create advanced shell scripts using shell built-ins and conditionals, and powerful commands used to perform advanced text processing operations.

Course Objectives:

1. To provide knowledge of UNIX Operating System and its File System.
2. To develop the ability to formulate filtration techniques using filters.
3. To provide a comprehensive knowledge of SHELL programming, services and utilities.
4. To develop the ability to learn Distributed processing and multi-tasking.
5. To Create Productive environment for software development using rich set of tools.

Course Outcomes:

	At the end of the course, the student will have the ability to:	Cognitive Level as per Bloom's Taxonomy	POs Mapped
CO1	Explain the architecture and features of UNIX Operating System and differentiate it from other Operating Systems	Understand/Re member	PO1
CO2	Demonstrate UNIX commands for file handling and process control	Understand	PO1,PO10
CO3	Build Regular expressions for pattern matching and apply them to various filters for a specific task	Apply	PO1,PO2,PO3,PO5
CO4	Analyze a given problem and apply requisite facets of SHELL programming in order to devise a SHELL script to solve the problem	Analyze	PO1,PO2,PO4,PO12

Unit-I:

Introduction to Unix-Brief History-What is Unix-Unix Components-Using Unix-Commands in Unix-Some Basic Commands-Command Substitution-Giving Multiple Commands.

The File system –The Basics of Files-What's in a File-Directories and File Names-Permissions-INodes-The Directory Hierarchy.

Outcome:

1. Demonstrate basic commands, command substitution, command chaining in UNIX.
2. Explain basics of files, directory hierarchy, permissions, and inodes in UNIX.

Activity:

Illustrate how UNIX commands are applicable in real time with an example.

Unit-II:

File Attributes and Permissions-The File Command knowing the File Type-The Chmod Command Changing File Permissions-The Chown Command Changing the Owner of a File-

The Chgrp Command Changing the Group of a File.

Outcome:
1. Analyze file command to know the file type and chmod command to change file permissions.
2. Demonstrate the chown command and chgrp command to change the owner and group of a file.

Activity:
Demonstrate the use of chmod, chown, chgrp commands in real time applications.

Unit-III:
Using the Shell-Command Line Structure-Met characters-Creating New Commands-Command Arguments and Parameters-Program Output as Arguments-Shell Variables- -More on I/O Redirection-Looping in Shell Programs. Filters-The Grep Family-Other Filters-The Stream Editor Sed-The AWK Pattern Scanning and processing Language-Good Files and Good Filters.

Outcome:
1. Demonstrate command arguments, shell variables, looping in shell programs.
2. Illustrate filters, the stream editor, the awk pattern scanning and processing language.

Activity:
Demonstrate the use of command arguments, shell variables, filters in real time applications.

Unit-IV:
Shell Programming-Shell Variables-The Export Command- The read Command-Positional parameters-The $? Variable knowing the exit Status-More about the Set Command-The Exit Command-The Expr Command: Performing Integer Arithmetic-Real Arithmetic in Shell Programs-The here Document(<<)-The Sleep Command-The Script Command-The Eval Command-The Exec Command.

Outcome:
1. Demonstrate the export, read, set, exit, expr commands.
2. Analyze The here Document(<<)-The Sleep Command-The Script Command-The Eval Command-The Exec Command

Activity:
Demonstrate the use of export, exit, expr, sleep, script, eval, exec command in real time applications.

Unit-V:
The Process-The Meaning-Parent and Child Processes-Types of Processes-More about Foreground and Background processes-Internal and External Commands-Process Creation, synchronization and mutual exclusion-The Trap Command-The Stty Command-The Kill Command-Job Control.
Sockets- Socket system calls for connection oriented protocol and connectionless protocol, example- client/server program, socket options.

Outcome:
1. Design parent and child processes, foreground and background processes.
2. Demonstrate internal and external commands, trap, stty, and kill commands.
3. Illustrate sockets, system calls for connection oriented protocol and connectionless protocol.

Activity:

Demonstrate the use of types of processes and sockets in real-time applications.

Text Books:
1. The Unix programming Environment by Brain W. Kernighan & Rob Pike, Pearson.
2. Introduction to Unix Shell Programming by M.G.Venkateshmurthy, Pearson.

Reference Books:
1. Unix and shell programmingby B.M. Harwani, OXFORD university press.

Course Code	PROFESSIONAL ELECTIVES 1 COMPUTER GRAPHICS	L	T	P	Credits
1005193153		3	0	0	3

Course Overview:

This course focuses on giving introduction about computer graphics, its wide range of application areas. Also gives information about the graphics hardware, working of hardware and software which are needed for producing graphics. It gives information about basic scan conversion algorithms, 2D, 3D transformations and viewing mechanisms, clipping algorithms, color models and Animation techniques

Course Objectives:

1. Develop, design and implement two and three dimensional graphical structures.
2. Acquire knowledge on usage of various algorithms used for drawing, filling and Animations.
3. Learn to create, manage various Multimedia techniques used in animation

Course Outcomes:

CO's	At the end of the course, the student will have the ability to:	Cognitive Level as per Bloom's Taxonomy	POs Mapped
CO1	To understand the various computer graphics hardware and display technologies	Understand	PO1
CO2	To implement various type of scan conversion algorithms, line and polygon clipping algorithms.	Apply	PO1,PO2
CO3	To apply different 2D and 3D transformation techniques & viewing technologies to real world problems	Apply	PO1,PO2, PO3
CO4	To understand the basic concepts of gaming theory	Understand	PO1

UNIT- I:

Introduction: Application areas of computer graphics, overview of graphics systems, video-display devices and raster-scan systems, random scan systems.

Scan Conversion: Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm;(algorithms & applications only) , scan line polygon fill algorithm, boundary fill algorithm, flood fill algorithm.

Outcome: Able to describe the architecture used in computer graphics programming
Activity: Implement a line drawing algorithm to draw a snowman.

UNIT -II:

2d - Geometrical Transforms: Basic transformations: translation, rotation, scaling; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection shear;

2d –Viewing : The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping

algorithms, Sutherland– Hodgeman polygon clipping algorithm (algorithms & applications only)

Outcome: Able to understand different types of clipping algorithms used in graphics
Activity: Add to your drawing algorithm implementing any one of the clipping algorithms.

UNIT- III:
3d - Object Representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-spline curves.
3d - Geometric Transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations.

Outcome: Able to understand key transformation algorithms used in real time scenario
Activity: Create a simple polygon that rotates in 3D on its y-axis

UNIT- IV:
Color Models – Intuitive colour concepts – RGB colour model – YIQ colour model – CMY colour model – HSV colour model – HLS colour model; Colour selection.
Computer Animation: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications

Outcome: Know and be able to select among models for lighting/shading: Color, ambient light; distant and light with sources; Phong reflection model; and shading (flat, smooth, Goraud, Phong).
Activity: Add a floor to your scene and add a shadow of your object on the floor. You should see the shadow change as the object spins.

UNIT -V:
Visible Surface Detection Methods: Classification, back-face detection, depth-buffer, ray tracing method, depth sorting, BSP tree methods.

Outcome: After reading this Unit, student should be able to:
1. Know and understand various colour models applied in real world.
2. Know and able to select graphics accelerators / co-processors
Activity: s Create a simple Screen saver program using basic OPENGL commands

TEXT BOOKS
 1. John F. Hughes, Andries Van Dam, Morgan Mc Guire ,David F. Sklar , James D. Foley, Steven K. Feiner and Kurt Akeley ,"Computer Graphics: Principles and Practice", , 3rd Edition, Addison-Wesley Professional,2013.
 2. Donald Hearn and Pauline Baker M, "Computer Graphics", Prentice Hall, New Delhi, 2007

REFERENCE BOOK
1. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics-Principles and practice, Second Edition in C, Pearson Education, 2007

Course Code	PROFESSIONAL ELECTIVES 1 ADVANCED COMPUTER ARCHITECTURE	L	T	P	Credits
1005193154		3	0	0	3

Course Overview:
To make students gain knowledge of the Computer Architectures and concepts of parallel computer models and to provide an intuition of Scalable Architectures, Pipelining, Superscalar processors and multiprocessors.

Course Objectives:
1. To gain knowledge of computational models and Computer Architecture.
2. To gain knowledge on parallel computer models.
3. To Understand Scalable Architectures, Pipelining, Superscalar processors and multiprocessors.

Course Outcomes:

CO's	At the end of the course, the student will have the ability to:	Cognitive Level as per Bloom's Taxonomy	POs Mapped
CO1	Understand Computational models and Computer Architectures.	Understand	PO1,PO2,
CO2	Design and Analyze parallel computer models.	Analyzing	PO1,PO2,PO4
CO3	Understand Scalable Architectures, Pipelining.	Understand	PO1,PO2
CO4	Understand Superscalar processors and multiprocessors.	Understand	PO1,PO2

UNIT- I:
Theory of Parallelism: Theory of Parallelism, Parallel computer models, The State of Computing, Multiprocessors and Multi computers, Multi vector and SIMD Computers, PRAM and VLSI models, Architectural development tracks, Program and network properties.
Outcome:
1. Illustrate Theory of Parallelism.
2. Outline Parallel computer models.
3. Explain Multiprocessors and Multi computers
Activity: Design a flow chart for SIMD computers.

UNIT -II:
Principals of Scalable performance: Principals of Scalable performance, Performance metrics and measures, Parallel Processing applications, Speed up performance laws, Scalability Analysis and Approaches, Hardware Technologies, Processes and Memory Hierarchy, Advanced Processor Technology.

Outcome:
1. Explain Principals of Scalable performance
2. Understand Performance metrics and measures
Activity: Design a flowchart for Scalability Analysis.

UNIT- III:

Bus Cache and Shared memory: Bus Cache and Shared memory, Backplane bus systems, Cache Memory organizations, Shared- Memory Organizations, Sequential and weak consistency models.
Pipelining and superscalar techniques: Pipelining and superscalar techniques, Linear Pipeline Processors, Non-Linear Pipeline Processors, Instruction Pipeline design, Arithmetic pipeline design, super scalar pipeline design.

Outcome:
1. Explain Cache and Shared memory
2. Understand & Apply Instruction Pipeline design

Activity: Build an Instruction Pipeline showing 6 tasks.

UNIT- IV:

Parallel and Scalable Architectures: Parallel and Scalable Architectures, Multiprocessors and Multicomputers, Multiprocessor system interconnects, cache coherence and synchronization mechanism, Three Generations of Multicomputers, Message-passing Mechanisms, Multivector and SIMD computers, Vector Processing Principals.

Outcome:
1. Explain Scalable Architectures
2. Understand Cache coherence and synchronization

Activity: Draw a flowchart for message passing mechanisms.

UNIT -V:

Scalable: Scalable, x, Latency-hiding techniques, Principals of Multithreading, Fine-Grain Multicomputers, Scalable and multithreaded Architectures, Dataflow and hybrid Architectures.

Outcome:
- ✓ Explain the Concept of Multithreaded and Dataflow Architectures.
- ✓ Outline basic concepts on Fine-Grain Multicomputers

Activity: Draw a flowchart for data flow and hybrid techniques.

TEXT BOOKS
1. Advanced Computer Architecture Second Edition, Kai Hwang, Tata McGraw Hill Publishers.

REFERENCE BOOK
1. Computer Architecture, Fourth edition, J. L. Hennessy and D.A. Patterson. ELSEVIER.
2. Advanced Computer Architectures, S.G. Shiva, Special Indian edition, CRC, Taylor &Francis.
3. Introduction to High Performance Computing for Scientists and Engineers, G. Hager and G. Wellein, CRC Press, Taylor & Francis Group.
4. Advanced Computer Architecture, D. Sima, T. Fountain, P. Kacsuk, Pearson education.
5. Computer Architecture, B. Parhami, Oxford Univ. Press.

Course Code	Python Programming Lab	L	T	P	Credits
1005193110		0	0	3	1.5

COURSE OBJECTIVES:

- To learn about Python programming language syntax, semantics, and the runtime environment.
- To be familiarized with universal computer programming concepts like data types, containers.
- To be familiarized with general computer programming concepts like conditional execution, loops & functions.
- 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:	POs Mapped	Strength of mapping
CO1	Develop essential programming skills in computer programming concepts like data types, containers	PO1	3
CO2	Apply the basics of programming in the Python language	PO1, PO2	3
CO3	Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming.	PO5	3 3
CO4	Solve coding tasks related OOPS, and Multithreading	PO12	3

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 andDictionaries 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 a. Define classes and objects using python for the real-world scenario b. Defining constructors and using Self c. Understand public and private members d. Practice calling class methods from another class e. Write built in functions to check, get, set and delete attributes	Implement the Python Classes and Objects to address the real-world scenarios
9.	**Exercise -9** Develop the programs to implement parent-child relationship a. Demonstrate different inheritance types b. Apply polymorphism and method overriding c. Create abstract classes	Develop the programs to implement parent-child relationship
10.	**Exercise -10** Write the programs to address the exceptions via exception handling in the development ofsolutions 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
11.	**Exercise -11** a. Create a series from a list, numpy array and dict b. Convert the index of a series into a column of a dataframe c. Combine many series to form a dataframe d. Assign name to the series' index e. Get the items not common to both series A and series B f. Get the minimum, 25th percentile, median, 75th, and max of a numeric series g. Get frequency counts of unique items of a series h. Bin a numeric series to 10 groups of equal size i. Find the positions of numbers that are multiples of 3 from a series Get the positions of items of series A in another series B	Pandas
12.	**Exercise -12** a. create a 1D array b. Extract items that satisfy a given condition from 1D array c. Replace items that satisfy a condition without affecting the original array	numpy

	d. Reshape an array	
	e. Extract all numbers between a given range from a numpy array	
	f. Swap two columns in a 2d numpy array	
	g. Import a dataset with numbers and texts keeping the text intact in python numpy	
	h. Compute the mean, median, standard deviation of a numpy array	
	i. Insert values at random positions in an array	
	j. Find the count of unique values in a numpy array	

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

Course code	UNIVERSAL HUMAN VALUES AND PROFESSIONAL ETHICS	L	T	P	Credits
1099193130		2	0	0	0

Course Overview:

Universal Human Values & Professional Ethicssubject provides character oriented education that instils basic values and ethnic value in one's individual professionalism.

Course Objectives:

1. To help the student to see the need for developing a holistic perspective of life.
2. To help students distinguish between values and skills and understand the need, basic guidelines, content and process of value education and Harmony.
3. To help the students understand their role as engineers, behavior and how to use ethical theories.
4. To help the students remember the codes, their responsibilities towards society, safety and risk.
5. Making the students aware and sensitive to value system in real life situations. To help the students to discriminate between ephemeral and eternal values.

Course Outcomes:

CO's	At the end of the course, the student will have the ability to:	PO's mapped	Strength of Mapping
CO1	Recognize importance of Universal human values, self-exploration and environment	PO8	3
CO2	Describe the core values that shape the ethical behavior of an engineerthrough value education, harmony and ethical human conduct.	PO8	3
CO3	Recall basics of professional ethics and Ethical theories.	PO8	3
CO4	Listing sustained happiness through identifying their responsibilities.		

Unit-I Universal Human Values-I – Introduction

Self-exploration- Aspirations and Concerns- Self-Management- Health- Relationships- Society-Natural Environment- Sharing and feedback

Unit-II
Universal Human Values-II - Understanding Harmony and Ethical Conduct

Introduction to Value Education- Harmony in the Human Being,Family and Society,Nature/Existence- Implications of the Holistic Understanding – a Look at Professional Ethics.

Unit-III
Engineering Ethics:
The History of Ethics-Purposes for Engineering Ethics-Engineering Ethics-Consensus and Controversy – Professional and Professionalism –Professional Roles to be played by an Engineer

–Self Interest, Customs and Religion-Uses of Ethical Theories-Professional Ethics-Types of Inquiry – Engineering and Ethics- Kohlberg's Theory – Gilligan's Argument –Heinz's Dilemma

Unit-IV
Engineering as Social Experimentation & Engineers' Responsibility for Safety and Risk

Engineers as Managers, Consultants, and Leaders – Accountability – Role of Codes – Codes and Experimental Nature of Engineering-Engineers'- Responsibility for Safety and Risk: Safety and Risk, Concept of Safety – Types of Risks - Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

Unit-V Engineers' Responsibilities and Rights:

Collegiality-Loyalty-Professionalism and Loyalty- Professional Rights –Professional Responsibilities-Conflict of Interest-Ethical egoism-Confidentiality-Acceptance of Bribes/Gifts-when is a Gift and a Bribe-examples of Gifts v/s Bribes-problem solving-interests in other companies- Occupational Crimes - Whistle Blowing -Cross-culture Issues.

Text Books:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. "Engineering Ethics and Human Values" by M.Govindarajan, S.Natarajan and V.S.SenthilKumar- PHI Learning Pvt. Ltd-2009
3. "Professional Ethics and Morals" by Prof.A.R.Aryasri, DharanikotaSuyodhana- Maruthi Publications
4. "Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran- Laxmi Publications
5. "Professional Ethics and Human Values" by Prof.D.R.Kiran

Reference Books:

1. Science & Humanism – towards a unified worldview, P. L. Dhar & R. R.Gaur (1990), Commonwealth Publishers, New Delhi.
2. AvartansheelArthshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India
3. Economy of Permanence – (a quest for social order based on non-violence), J. C. Kumarappa (2010), Sarva-Seva-Sangh-Prakashan, Varansi, India
4. Energy and Equity, Ivan Illich (1974), The Trinity Press, Worcester &Harper Collins, USA
5. "Indian Culture, Values and Professional Ethics" by PSR Murthy-BSP Publication
6. "EthicsinEngineering"byMikeW.MartinandRolandSchinzinger–TataMcGraw-Hill–2003.
7. "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
8. Sociology Themes and Perspectives, Harper Collins; EIGHT edition (2014), Martin Holborn and Peter Langley, 1980.
9. Samagrakranti: Jaya Prakash Narayan's philosophy of social change, Siddharth PublicationsRenu Sinha, 1996.
10. Small Is Beautiful: A Study of Economics as if People Mattered, E. F.Schumacher, 1973, Blond & Briggs, UK.

E-Books and Online Resources:

1.https://soaneemrana.org/onewebmedia/Professional%20Ethics%20and%20Human%20Values %20by%20R.S%20NAAGARAZAN.pdf
2.https://india.oup.com/productPage/5591038/7421214/9780199475070

NPTEL/SWAYAMMOOCS:

1. https://nptel.ac.in/courses/109/104/109104068/
2. https://onlinecourses.swayam2.ac.in/ntr19_ge06/preview