B. Tech in CSE (Artificial Intelligence and Data Science)

Under Regulations- R-26

(w.e.f. 2026-27 admitted batch)

Course Structure and Syllabi

VISION

The Apollo University aspires to create global leaders of the future, preparing them for a constantly evolving world and empowering them to build a healthier and more equitable society.

MISSION

The Mission is to achieve this vision through transformative education, developed at the intersection of healthcare, science, technology, and management, having roots in innovation & research, in an inclusive culture that fosters practical oriented knowledge, stimulates critical thinking and sustains our legacy of pioneering and excellence, for the benefit of mankind.

THE APOLLO UNIVERSITY

MURUKAMBATTU, CHITTOOR (Dt) 517127

ANDHRA PRADESH

PROGRAM OUTCOMES (PO)

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.

PO 2: Problem analysis: Identify, formulate, research literature, and Analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.

PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: Recognizes the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM EDUCATIONAL OBJECTIVES (PEO):

PEO1: To develop graduates with a strong understanding of evolving technologies in Artificial Intelligence and Data Science for pursuing successful careers in industry and higher education.

PEO2: To develop the ability to innovate, analyze, and make informed decisions to provide techno-commercially feasible and socially responsible solutions to real-world problems using Artificial Intelligence and Data Science.

PEO3: To foster lifelong learning, professional competence, and ethical values to address global challenges and contribute positively to society and the environment.

PROGRAM SPECIFIC OUTCOMES (PSOs)

After successful completion of the program, graduates will be able to:

PSO1: Analyze and solve computational and real-world problems by applying acquired knowledge and skills in Artificial Intelligence and Data Science.

PSO2: Apply AI, Data Science, and Data Analytics techniques to design, develop, and optimize software-based solutions for real-world applications.

THE APOLLO UNIVERSITY

ACADEMIC REGULATIONS

SCOPE:

This Academic regulation provide a framework for the regulatory guidelines of all programmes offered by The Apollo University. It includes procedures and practices that are to be followed to ensure academic standards in the University. The regulations are approved by the Academic Council. These regulations may be amended from time to time with the approval of the Academic council for the benefit of students or some times to reflect the changes suggested by the statutory bodies.

Information regarding amendments (if any) to the regulations will be communicated to the students by publishing in the University website. Students must follow the amended regulations as they might impact the process for the award of degree. The decision of the Vice Chancellor shall be the final in case of any discrepancy. These regulations apply to all students, despite the programme of study.

1. ADMISSION INTO THE PROGRAMME

The University admits the students in two modes. One through the convenor quota as per the Andhra Pradesh Private Universities Act, for which the admissions will be carried out through the convener quota by the Govt of Andhra Pradesh. The other is through university quota for which the following procedure will be followed:

A. The applicant shall satisfy the entrance requirements specified by The Apollo University and in accordance with guidelines of statutory councils for Under-graduation.
B. The Applicant shall be qualified in the qualifying examination for a particular programme.
C. The Applicant secures a rank in national level entrance exam or suitable such test conducted by The Apollo University / professional body.
D. The Applicant qualifies in the specified state or national level examinations prescribed by The Apollo University.

The Apollo University will widely notify the counselling schedule for admissions into the academic programmes in the media. The provisional admission will be given to the eligible students during the counselling scheduled by The Apollo University. The selected candidates will be provisionally admitted into the programme of his/her choice if the candidate meets the programme specific requirements in addition to academic performance qualifying exam. Admission is purely based on merit and so merely meeting the requirements will not ensure admission. The University does not discriminate based on gender, race, region,

religion, disability or nationality. The University reserves the right to make admissions based on various criteria which is specified in the admission brochure.

2. ELIGIBILITY CRITERIA

Undergraduate programs

The qualifying exam eligibility for each programme is given Annexure 1. The student should have passed the qualifying exam either in the year the student is seeking admission or the previous year.

Convener Quota: The student seeking admission to any programme under convener quota shall qualify in the relevant entrance exam conducted by the Government of Andhra Pradesh.

University Quota: For getting admission under university quota, percentage of marks obtained in the qualifying exam, the rank obtained in TAU entrance exam or any recognized national level examination in the year of admission will be considered.

Counselling

All the eligible students need to apply for admission and have to attend counselling conducted by TAU as per the schedule for the university quota. The list of programmes offered is given in Annexure-1.

3. PROGRAMMES

The Apollo University offers variety of programmes which includes certificate, undergraduate, postgraduate, and Research. The list of programmes offered is given in Annexure 2

Minimum duration of the programme

The minimum duration of each programme depends on the type of programme, viz., undergraduate, postgraduate, integrated programmes, etc., and the faculty which offers the programme. The maximum duration of the programme is N+2 years, where N stands for the minimum duration of the programme. For UG programmes, the minimum duration is 4 years; for PG programmes, it is 2 years; and for Ph.D. programmes, the minimum duration is 3 years for full-time candidates and 4 years for part-time candidates. If the student has not obtained the minimum number of credits within the stipulated time, the Vice-Chancellor may extend the maximum duration in extenuating circumstances upon receiving a request along with reasons from the student for not completing the programme on time.

4. CHOICE BASED CREDIT SYSTEM

The choice-based credit system (CBCS) facilitates the education student-centric. It provides the opportunity for the learner to choose the courses from a basket of core, elective, and skill enhanced courses. All programmes of study are designed to meet the specified number of credit requirements. The courses taken by the student in each semester as part of programme are allotted some credit points based on the number of hours assigned. Upon successful completion of the course, the student secures the number of credits

allotted for that course. Once the minimum number of credits of the programme is achieved, the degree can be awarded, subject to fulfilment of all other relevant conditions.

5. STRUCTURE OF THE PROGRAMME

The Programme structure Consists of

i) University Courses
   A. University Core
   B. University Electives
ii) Faculty Courses
   A. Faculty Core
   B. Faculty Electives
iii) Programme Courses
   A. Programme Core
   B. Programme Electives

Each course* is assigned a certain number of credits depending upon the number of contact hours (lectures/tutorials/practical) per week. (*one course means one subject)

Core Courses = 3 Credits /4 Credits Elective =3 Credits

In general, credits are assigned to the courses as detailed below:

- A classroom lecture/ tutorial of 60 min (1 hr) duration per week, spread over the entire semester, shall be considered as one credit.
- A laboratory session of minimum of 120 min (2 hr) per week shall be considered as one credit.
- A project work/ Internship session of 60 minutes (1 hr) carried out per week shall be considered as one credit.

6. MEDIUM OF INSTRUCTION

The medium of instruction (including examinations and project reports) shall be English.

7. REGISTRATION

Any of the following student must register for the courses opted in a particular semester during the scheduled registration period.

i. a new student who enrolls into any programme
ii. an existing student who is continuing on rolls from the preceding regular semester
iii. a former student, i.e., who has not enrolled in the preceding regular semester or who has availed academic break or detained and got readmission

Each newly admitted student shall attend an induction/ orientation programme prior to commencement of the first semester. During this programme academic advisors assist the students in choosing the courses. Existing student may register online by using their registration number and mail ID through the Apollo ERP portal. Class schedules are available approximately two weeks before the beginning of every semester for each programme. The concerned head of the department must approve class schedule.

8. ATTENDANCE REQUIREMENTS

- Students should earn a minimum of 80% attendance in the current semester to become eligible to write the Semester End Examinations.
- The monthly statement of attendance will be displayed on the Department Notice Board/ Apollo ERP by the respective departments within the first five working days of the following month.
- Candidates who are falling short of 80% attendance will be detained on the recommendation of the HoD and are not eligible to appear for the current semester examinations. The students who are detained in the current semester will not be allowed to register for the next semester and they have to repeat the same semester by paying the tuition fee prescribed. However, they can write arrear subjects, if any.

9. EVALUATION

The assessment of the student's performance in a Theory course shall be based on two components: Continuous Evaluation (40 marks) and Semester-end examination (60 marks). A student has to secure an aggregate of 40% in the course in the two components put together to be declared to have passed the course, subject to the condition that the candidate must have secured a minimum of 24 marks (i.e. 40%) in the theory component at the semester-end examination. Practical/ Project Work/ Industrial Training/ Viva voce/ Seminar etc. are completely assessed under Continuous Evaluation for a maximum of 100 marks, and a student has to obtain a minimum of 50% to secure Pass Grade. For courses having both theory and practical components, 60% of the weightage will be given for theory component and 40% weightage for practical component. The student must secure 40% (Theory + Practical) with 24 marks minimum in theory to attain pass grade.

Details of Assessment Procedure are furnished below in Table 1.

Table 1: Assessment Procedure

S. No.	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Evaluation
1	Theory	40	Continuous Evaluation	i) Twenty (20) marks for mid examinations. Three mid examinations shall be conducted for 20 marks each; average of the best two performances shall be taken into consideration. ii) Ten (10) marks for Quizzes, Assignments and Presentations. iii) Ten (10) marks for periodic evaluation, case studies and projects iv) Sixty (60) marks for Semester-end examinations
		60	Semester-end Examination	
	Total	**100**		
2	Laboratory	100	Continuous Evaluation	1)80 marks with equal weightage to all experiments subject to conduct of minimum of 10 experiments 2)20marks for the end exam (with one of our university teachers as external other than course teacher)
3	Internship	100	Continuous Evaluation	i) (80) marks for periodic evaluation of Internship report by the Project Supervisor. ii) Twenty (20) marks for final Report presentation and Viva-voce, by a panel of internal examiners.

				iii) Students shall undergo TWO internships during the course of time and the evaluation shall be done during final semester.
4	Project work	100	Continuous Evaluation	iv) (80) marks for periodic evaluation and technical report writing by the Project Supervisor. ii) Twenty (20) marks for final Report presentation and Viva-voce, by a panel of internal examiners
5	Students Seminars	100	Continuous Evaluation	Each student has to give a seminar on any topic in consultation with the faculty member in charge A detailed report shall be submitted to the in charge. 60 marks for periodic evaluation including report preparation and 40 marks for viva voce by a panel of examiners.

GRADING SYSTEM

Based on the student performance during a given semester, a final letter grade will be awarded at the end of the semester in each course. The letter grades and the corresponding grade points are as given inTable2.

Table 2: Grades & Grade Points

Sl. No.	**Grade**	**Grade Points**	**Absolute Marks**
1	O(Outstanding)	10	90 and above
2	A+(Excellent)	9	80 to 89
3	A (Very Good)	8	70 to 79
4	B+(Good)	7	60 to 69

5	B (Above Average)	6	50 to 59
6	C(Average)	5	45 to 49
7	P(Pass)	4	40 to 44
8	F(Fail)	0	Less than 40
9	Ab. (Absent)	0	-

SEMESTER GRADE POINT AVERAGE (SGPA)

A Semester Grade Point Average (SGPA) for the semester will be calculated according to the formula:

$$SGPA = \frac{\sum [\, C \, X \, G \,]}{\sum C}$$

Where

C=number of credits for the course,

G=grade points obtained by the student in the course.

A student who earns a minimum of 4 grade points (P grade) in a course is declared to have successfully completed the course, and is deemed to have earned the credits assigned to that course.

CUMULATIVE GRADE POINT AVEARGE (CGPA)

A similar formula is used to arrive at Cumulative Grade Point Average (CGPA), considering the student's performance in all the courses taken in all the semesters up to the particular point of time.

Table 3 shows the CGPA required for the award of class after the successful completion of the programme.

Table3: CGPA required for award of Class

Class	**CGPA Required**
First Class with Distinction	≥8.0*
First Class	≥6.5
Second Class	≥5.5
Pass Class	≥5.0

*In addition to the required CGPA of 8.0 or more, the student must have necessarily passed all the courses of every semester in first attempt.

11. REAPPEARANCE

a. A student who has secured 'F' grade in a Theory course shall have to reappear at the subsequent Semester end examination held for that course.
b. A student who has secured 'F' grade in a Practical course shall have to attend Special Instruction Classes scheduled by the Department for securing pass.
c. A student who has secured 'F' Grade in Internship /Project work / Industrial Training etc shall have to reappear for Viva – voce scheduled by the department.
d. A student who is declared fail (F) in a course/s can apply for revaluation within one week from the date of publication of results with a fee prescribed by the university. The marks /grade awarded in the revaluation is final.

11.1 PROCEDURE FOR REVALUATION

- The students who have not satisfied with the marks awarded by the examiner can apply for revaluation of his/her answer script/s
- The students have to apply through proper channel for revaluation and to pay the revaluation fee per paper to the university towards revaluation fee.
- Students have to apply for revaluation within 7 days from the date publication of result.
- The scripts will get valued by second examiner and if the difference is more than 15 marks, they will get valued by the third examiner. The average of the nearest two marks will be declared as the final marks.

11.2 ASSESSMENT MECHANISM

The Apollo University offers a student the benefits of Choice Based Credit System. Every paper is allotted a certain number of credits as per the UGC norms. A student is awarded the specified credits on obtaining a pass in the respective paper.

The Choice Based Credit System (CBCS) has been adopted for UG Course from the year 2021-22 onwards as per the recommendations of the A.P. State Council for Higher Education (APSCHE). The structure of undergraduate programmes provides a wide range of choice for students to opt for courses based on their eligibility, aptitude and career goals.

11.3 SEMESTER END EXAMINATION

The End semester examination will be a comprehensive examination of 3 hours duration. Two End Semester examinations are conducted in a year-

Odd semester examinations in November/ December and

Even semester examination in May/June

Practical examination / Project viva will be held 2 weeks prior to the theory semester end examinations.

Under-Graduation Programs

Course	Continuous Assessment	End semester	Aggregate in End semester Examinations
All UG Courses	No passing minimum	40%	40%

11.4 POST EVALUATION PROGRAMME:

Under the Post Evaluation Programme there are three menus:

- Provision for improvement
- Re-totalling and Revaluation of answer scripts
- Restrictions to appear for the examinations

11.5 PROVISION FOR IMPROVEMENT

A student who passes a paper in the first attempt can reappear for the same paper in the succeeding End-of-Semester examination only, for improving his/her marks. Re-appearance for improvement is allowed for theory and practical subjects of all semesters, except for the final semester subjects. Revised mark statement will be issued after withdrawing the previous one, if the marks obtained in improvement are higher than the marks awarded earlier. When there is no improvement, there shall not be any change in the original marks already awarded. The improved marks shall be considered for classification but not for ranking.

Provision for Re-totalling and Revaluation of valued answer scripts

- UG candidates may apply for re-totalling / revaluation of valued answer scripts, to the Controller of Examinations through the Heads of Departments and Principal / Dean, in the prescribed forms, remitting the prescribed fee within 7 days from the date of publication of

results. Revaluation of answer scripts is permissible only for the current semester papers and not for any arrear paper.

- Those wish to apply for revaluation of final semester papers can do so within five days from the date of publication of results. In re-valuation, the answer papers will be valued by an external examiner and if there is a difference of 15 marks between the two evaluations then the script will be sent for third valuation which is final and the mark awarded by the third examiner will be taken into the account.
- Revised mark statement will be issued after withdrawing the previous one, if the marks obtained in revaluation / retotalling are higher than the marks obtained earlier. In other cases, the original marks obtained earlier will be retained and the matter will be intimated to the student concerned as 'No change'.
- A candidate who applies for revaluation should not apply for retotalling.

Restrictions to appear for the examinations

Candidates who fail in any of the papers in the UG End semester examinations shall complete the paper concerned within N+2 years from the date of admission to the particular course. If they fail to do so, they shall re-register their names and take the examination in the texts/revised regulations/syllabus of the paper prescribed for the subsequent batch of candidates, in force at the time of their reappearance. In the event of removal of that paper consequent to change of regulation and/or curriculum after N+2 years period, the candidate shall have to take up an equivalent paper in the revised syllabus as suggested by the Chairman, Board of Studies concerned.

12. BETTERMENT OF GRADES

A student who has secured only a Pass or Second class and desires to improve his/her Class can appear for Betterment Examinations only in Theory courses of any Semester of his/her choice, conducted in Summer Vacation along with the Special Examinations. Betterment of Grades is permitted 'only once' immediately after completion of the programme of study.

13. DETENTION AND RE-ADMISSION

If a student fails to meet the minimum attendance requirement or minimum standards for academic progression, the concerned academic head will recommend for detention and it will be notified by the concerned Dean of the School. The students who are detained in the current semester will not be allowed to register for the next semester and they have to repeat the same semester.

The candidates who are detained or availed academic break or suspended in the previous semester/academic year and want to continue their study shall apply for re-admission to the university. The candidates shall request for re-admission to the respective Head of the Department, with details viz., Full Name, Registration Number, Department, School, Fee payment particulars with proofs and reasons for discontinuations. The concerned academic head will forward it to the Registrar with specific comments. The Registrar will notify the decision of re-admission which shall include the prescribed fee particulars, semester/ year into which readmission is granted and additional courses to be completed by the student (if any). The candidates should apply for re-admission in advance, that is before the commencement of the semester.

14. GROOMING AND ATTIRE FOR STUDENTS

Grooming and Etiquette is of great significance in the dynamic of shaping one's Personality. The Apollo University stands by a *Code of Grooming, Attire and Etiquette* that promotes a professional standard: Academic Day; Campus Placements and Non-Academic Hours on Campus.

The Dress Code to be in compliance on academic premises while attending: Formal Functions of the Institution / Lectures / Practicals / Dining Area / Library / Labs / Office Areas.
Students shall follow appropriate attire during Academic and Non-Academic hours on the campus. Students shall wear clean, neat, pressed and presentable clothing, and command respect by dressing in accordance with responsible personal norms. Students shall always wear The Apollo University ID Card with the Lanyard.

Grooming and Formal Wear - Boys:

Formal Shirts / T-Shirts with a Collar should preferably be tucked in with a Formal pair of Pants Shoes and Socks to complete the Formal Attire. Personal Hygiene should be followed and Hair should be well groomed.

Smart Casuals for Boys:

Long Kurtas / Formals / Semi-Formal Shirts with Jeans.

Grooming and Formal Wear - Girls: Sarees / Salwar Suits / Leggings or Jeggings with Long Kurtis / Long Frocks / Long Skirts / Palazzos. Complement the outfit with proper footwear. Personal Hygiene should be followed and Hair should be well groomed.

Smart Casuals for Girls:

Jeans with long Kurtis / Long Skirts / Long Frocks.

Attire for Non-Academic Hours On Campus:

The students should be neatly attired during Non-Academic Hours on Campus.

DRESS CODE FOR BOYS:

Jeans / Track Suits / T-Shirts / Trousers / Shirts.

Dress Code for Girls:

Jeans / T-Shirts or Blouses / Salwar Suits / Palazzos / Leggings or Jeggings with Long Tops / Sarees / Long Skirts / Track Suits.

DO'S AND DO'NTS FOR BOYS AND GIRL STUDENTS OF THE UNIVERSITY:

- To wear modest clothing that reflects the essence of good personal grooming standards.
- To refrain from wearing Sleeveless Clothing; Shorts; Short Tops, etc.,

PLEASE NOTE: The decision as to what constitutes Appropriate Attire vests with the Authorities of The Apollo University.

15. ELIGIBILITY FOR AWARD OF THE DEGREE

The undergraduate degree will be of 4-years of duration. A student shall be declared as eligible for the award of the degree if the candidate has successfully secured the minimum number of required credits as specified in the curriculum corresponding to the branch of his/her study within the stipulated time.

After successful completion of the programme, a provisional certificate cum memorandum of grades (PCMG) will be issued to the students. The PCMG includes the secured grades and class achieved in chosen programme and specialization if any, along with grades and CGPA secured by the student. The original degree will be presented in the subsequent convocation.

16. DISCRETION POWER

Not with-standing anything contained in the above sections, the Vice Chancellor may review all exceptional cases, and give his decision, which will be final and binding.

ANNEXURE 1

ELIGIBILTY FOR QUALIFYING EXAM FOR UNDER GRADUATE PROGRAMMES

Programme Type	**Programme Name**	**Eligibility**
Bachelor's	**B.Tech. Programme**	Candidates must secure 50% in Physics, Chemistry and Mathematics of Intermediate or in the diploma course or must have appeared for Class 12 or equivalent examination with Physics, Chemistry, and Mathematics as major subjects from any recognized board. Candidates who have completed or qualified the final year of diploma in engineering courses and should attain 17 Years as on 31st December of the preceding calendar year.
Bachelor's	**B.Tech. Programme** (Lateral Entry to Second Year)S	Passed Minimum THREE years / TWO years (Lateral Entry) Diploma examination with at least 45% marks (40% marks in case of candidates belonging to reserved category) in ANY branch of Engineering and Technology. OR Passed B.Sc. Degree from a recognized University as defined by UGC, with at least 45% marks (40% marks in case of candidates belonging to reserved category) and passed 10+2 examination with Mathematics as a subject. OR Passed B.Voc/3-year D.Voc. Stream in the same or allied sector. (The Universities will offer suitable bridge courses such as Mathematics, Physics, Engineering drawing, etc., for the students coming from diverse backgrounds to achieve desired learning outcomes of the programme)

ANNEXURE 2

PROGRAMMES OFFERED BY SCHOOL OF TECHNOLOGY

l. No.	**Programme**	**Expanded**	**Level**	**Minimum Duration in Years (N)**
1	B. Tech. CSE	Bachelor of Technology in Computer Science and Engineering	UG	4
2.	B. Tech. CSE (AI& DS)	Bachelor of Technology in Computer Science and Engineering (Artificial Intelligence and Data Structures)	UG	4
3	B. Tech. CSE (AI& ML)	Bachelor of Technology in Computer Science and Engineering (Artificial Intelligence and Machine Learning)	UG	4
4	B. Tech CSE (Cyber Security)	Bachelor of Technology in Computer Science and Engineering (Cyber Security)	UG	4
5	B. Tech CSE (Cloud Computing)	Bachelor of Technology in Computer Science and Engineering (Cloud Computing)	UG	4
6	B. Tech CSE (AI & Healthcare Technology)	Bachelor of Technology in Computer Science and Engineering (Artificial Intelligence & Healthcare Technology)	UG	4
7	M. Tech (VLSI Design & ES)	Master of Technology in Very Large-Scale Integration Design and Embedded Systems	PG	2
8	M. Tech (CSE)	Master of Technology in Computer Science and Engineering	PG	2
9	M. Tech (Data Science)	Master of Technology in Data Science	PG	2

I Semester

3 Week Induction Programme						
Course Code	**Course Name**	**Periods per week**			**Credits**	**Hours per week**
		L	**T**	**P**		
26SOTT1701	Engineering Physics	3	0	0	3	3
26SOTT1702	Linear Algebra and Multivariable Calculus	3	1	0	4	4
26SOTT1801	Programming for Problem Solving	3	1	0	4	4
26TAUT1101	Communicative English (University Core – I)	3	0	0	3	3
OE	University Elective I	3	0	0	3	3
26SOTL1701	Engineering Physics Lab	0	0	2	1	2
26SOTL1801	Programming for Problem Solving Lab	0	0	2	1	2
26SOTL1802	IT Workshop	0	0	2	1	2
26SOTL1901	Design Thinking Lab	0	0	2	1	2
26SOTL1902	Communicative English Language Lab	0	0	2	1	2
	Physical Activity	0	0	0	0	2
	Extra-Curricular Activity	0	0	0	0	2
	Library	0	0	0	0	1
	Mentoring	0	0	0	0	1
	Technical Seminar	0	0	0	0	1
	Cocurricular Activity	0	0	0	0	2
TOTAL		**15**	**2**	**10**	**22**	**36**

University Elective-I

(Semester-I)

S.No	Host Department	University Elective Course	Course Code
1	School of Health Sciences - AHS	Basics of Health Management	26TAUT1201A
2		Basic emergency care and life support skills	26TAUT1201B
3	School of Health Sciences - BMS & GMB	Biostatistics	26TAUT1201C
4		Organic Farming	26TAUT1201D
5	School of Health Sciences - PH	One Health	26TAUT1201E
6	School of Health Sciences - Physiotherapy	Basics of Physiotherapy	26TAUT1201F
7	School of Health Sciences - Psychology	Personality Development	26TAUT1201G
8	Apollo Institute of Nursing	Nursing	26TAUT1201H
9	School of Management	Entrepreneurship	26TAUT1201I
10		Managerial Economics	26TAUT1201J
11		Leadership Development	26TAUT1201K
12		Social Entrepreneurship	26TAUT1201L
13	School of Social Sciences	Gender and Development	26TAUT1201M
14		Constitution of India	26TAUT1201N
15	School of Technology-Maths	Mathematical Thinking	26TAUT1201O
16	School of Technology-CSE	Introduction To Computing and Digital Literacy	26TAUT1201P
17		Ethical Hacking	26TAUT1201Q

II SEMESTER

Course Code	Course Name	Periods per week			Credits	Hours per
		L	T	P		
26SOTT1703	Probability & Statistics	3	1	0	4	4
26SOTT1802	Basic Electrical and Electronics Engineering	3	0	0	3	3
26SOTT1301	Data Structures	3	1	0	4	4
26SOTT1803	Programming using Python	3	0	0	3	3
26SOTT1901	Universal Human Values	3	0	0	3	3
26SOTT1902	Environmental Studies (University Core - II)	3	0	0	0	3
H&S	University Elective II	3	0	0	3	3
26SOTL1803	Basic Electrical and Electronics Engineering Lab	0	0	2	1	2
26SOTL1301	Data Structures Lab	0	0	2	1	2
26SOTL1804	Programming using Python Lab	0	0	2	1	2
	Physical Activity	0	0	0	0	2
	Extra-Curricular Activity	0	0	0	0	2
	Mentoring	0	0	0	0	1
	Cocurricular Activity	0	0	0	0	2
TOTAL		21	2	6	**23**	**36**

University Elective – II

(Semester -II)

S. No	Name of the Course	Course Code
1	Telugu	26TAUT1202A
2	Tamil	26TAUT1202B
3	Hindi	26TAUT1202C
4	Professional English	26TAUT1202D
5	Sanskrit	26TAUT1202E
6	French	26TAUT1202F
7	German	26TAUT1202G
8	Spanish	26TAUT1202H
9	Japanese	26TAUT1202I
10	Korean	26TAUT1202J

III SEMESTER

Course Code	Course Name	Periods per week			Credits	Hours per week
		L	T	P		
26SOTT2701	Number Theory and Discrete Structures	3	0	0	3	3
26SOTT2301	Design and Analysis of Algorithms	3	1	0	4	4
26SOTT2302	Object Oriented Programming through Java	3	0	0	3	3
26SOTT2801	Digital Logic Design	3	0	0	3	3
26TAUT2101	Health and Wellness (University Core – III)	3	0	0	3	3
OE	University Elective -III	3	0	0	3	3
26SOTT2901	Constitution of India (Audit)	3	0	0	0	3
26SOTL2301	Java Programming Lab	0	0	2	1	2
26SOTL2801	Digital Logic Design Lab	0	0	2	1	2
26SOTJ2301	Software Development Using Git	1	0	2	2	3
	Physical Activity	0	0	0	0	2
	Extra-Curricular Activity	0	0	0	0	2
	Mentoring	0	0	0	0	1
	Cocurricular Activity	0	0	0	0	2
TOTAL		22	1	6	**23**	**36**

University Elective – III

(Semester -III)

S. No	Host Department	Name of the Course	Course Code
1	Apollo Institute of Pharmaceutical Sciences	Cosmetic Science	26TAUT2201A
3	School of Health Sciences - AHS	Infection Prevention & Control	26TAUT2201B
4		Antibiotic Resistance & Biomedical Waste Management	26TAUT2201C
5	School of Health Sciences - BMS & GMB	Medical Terminology	26TAUT2201D
		Clinical Nutrition	26TAUT2201E
6	School of Health Sciences - PH	Behaviour Change Communication	26TAUT2201F
7		Social Network Analysis	26TAUT2201G
8	School of Health Sciences - Psychology	Emotional Intelligence & Mental Health	26TAUT2201H
9		Disability Management	26TAUT2201I
10	School of Management	Hospital Planning and Organization	26TAUT2201J
11	School of Health Sciences -Social Sciences	Disaster Management	26TAUT2201K
12		Human Values & Professional Ethics	26TAUT2201L
13		Human Rights	26TAUT2201M
14		NSS & Youth Development	26TAUT2201N
15		Community Engagement	26TAUT2201O
16	School of Technology	Fundamentals of Artificial Intelligence	26TAUT2201P
17		Industry 4.0	26TAUT2201Q
18		Fundamentals of Cyber Security	26TAUT2201R

IV SEMESTER

Course Code	Course Name	Periods per week			Credits	Hours per week
		L	T	P		
26SOTT2902	Management for Engineers	3	0	0	3	3
26SOTT2303	Computer Organization and Architecture	3	0	0	3	3
26SOTT2304	Database Management Systems	3	1	0	4	4
26SOTT2305	Operating Systems	3	1	0	4	4
26SOTJ2302	Artificial Intelligence and Machine Learning	3	0	2	4	5
26BTAT2501	Foundations of Data Science	3	0	0	3	3
26SOTT2903	Indian Knowledge System (Audit)	3	0	0	0	3
26SOTL2302	Database Management Systems	0	0	2	1	2
26BTAL2501	Foundations of Data Science Lab	0	0	2	1	2
	Internship – I*	-	-	-	-	-
	Physical Activity	0	0	0	0	2
	Extra-Curricular Activity	0	0	0	0	2
	Mentoring	0	0	0	0	1
	Cocurricular Activity	0	0	0	0	2
TOTAL		**21**	**2**	**6**	**23**	**36**

***** This Course should be undertaken during summer break and evaluated in Semester VIII

Semester – I

26SOTT1701	**Engineering Physics**	L	T	P	C
	(Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	**3**	**0**	**0**	**3**

Prerequisite: Basic knowledge of higher secondary school physics and mathematics.

Course Description:

This course covers a wide range of topics like waves, electronics, quantum physics, optics, semiconductors, and the foundations of quantum computing. It offers an accessible and engaging introduction to the fundamental concepts of modern physics and their applications in quantum computing and electives. By focusing on the scientific method as a rigorous basis, it seeks ways to apply, design, and develop new solutions in engineering.

Course Objectives:

1. To introduce fundamental concepts of physics that help students apply principles of interference, diffraction, and polarization in advanced optical systems.
2. To introduce quantum aspects of nature starting from the wave concepts of nature, and to interpret Schrödinger's equation for simple quantum systems.
3. To introduce various applications of quantum mechanics such as semiconductor devices.
4. To explain quantum superposition, entanglement, and quantum gates for computation.
5. To apply magnetism and superconductivity for superconducting qubits and quantum circuits.

Unit - I	**Wave Optics**	**8 Hrs**

Super Position of Waves, Refraction, Reflection, Principles of interference, thin film interference, Quantum interference. Principles of Diffraction, Single Slit, double slit diffraction grating (Qualitative). Polarization and types, methods of Polarization, Brewster's Law, and Malus' Law

Unit - II	**Concepts of Quantum Mechanics**	**10 Hrs**

Particle properties of waves, de-Broglie's hypothesis, Heisenberg uncertainty principle and its application, Postulates of quantum mechanics - Wave function, Quantum states and measurement, Hilbert space, Schrodinger wave equations: Time dependent and independent, Applications of Schrodinger wave equation: particle in a box and Quantum Harmonic Oscillator.

Unit - III	**Semiconductor Devices**	**9 Hrs**

Intrinsic and extrinsic types, carrier density, variation of fermi level with temperature and doping, drift & diffusion currents, Direct & indirect band gap semiconductors, Hall effect, p-n junction diode and its characteristics, Zener diode, PIN photodiode, solar cell, LED.

Unit - IV	**Foundations of Quantum Computing**	**10 Hrs**

Quantum bits and representation of qubits, distinction between classical bit and quantum bit, quantum logic gates; single and multi-qubit systems, Bloch sphere visualization, Quantum vs classical computers, Principles of superposition, Quantum Parallelism. Measurement of Quantum states and observation, Quantum Entanglement: introduction.

Unit - V	**Magnetism and Superconductivity for Quantum Technologies**	**8 Hrs**

Atomic origin and classification of magnetic materials, Diamagnetic, paramagnetic, ferromagnetic, antiferromagnetic, and ferrimagnetic materials; characteristics, temperature dependence, Curie and Néel temperatures, hysteresis, magnons. Superconductors: Type I & II, BCS theory, Josephson junctions, superconducting qubits, Quantum circuits, SQUIDs, superconductors in quantum computers.

Total Hours	**45 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Apply optical interference, diffraction, and polarization principles in designing quantum optical systems.	PO1, PO2	**1,2**	**4**

2. Understand and solve simple quantum systems using Schrödinger's equation and interpret quantum systems.	PO1, PO2	**1,2**	**3**
3. Demonstrate a basic understanding of semiconductor devices.	PO1, PO2, PO3, PO5	**1,2,3**	**4**
4. Understand the basic concepts of quantum computing.	PO1, PO2, PO3, PO5, PO12	**1,2,3**	**3**
5. Apply the basic magnetic and superconducting principles relevant to superconducting qubits and quantum circuits.	PO1, PO2, PO5, PO6, PO7, PO12	**1,2,3**	**4**

Text Books:

1. Engineering Physics, M.N. Avadhanulu, P.G. Kshirsagar & T.V.S. Arun Murthy, 11/e, 2018, S. Chand & Company Ltd.
2. Quantum Computing for Everyone, Chris Bernhardt, 1/e, 2020, The MIT Press.
3. Optics, Ajoy Ghatak, 7/e, 2017, McGraw Hill Education (India) Private Limited.
4. Quantum Computing: A Beginner's Introduction, Parag K. Lala, 1/e, 2019, McGraw-Hill Education.
5. Engineering Physics, H.K. Malik & A.K. Singh, 2/e, 2018, McGraw Hill Education (India) Private Limited.

Reference Books:

1. Superconductivity: Basics and Applications to Magnets, P.N. Barnes, Springer, 1/e, 2015.
2. Concepts of Modern Physics, Arthur Beiser & Shobhit Mahajan, Tata McGraw-Hill Education, 7/e, 2012.
3. Fundamentals of Physics, Halliday, Resnick & Walker, John Wiley & Sons, 10/e, 2013.
4. Quantum Computation and Quantum Information, Michael A. Nielsen & Isaac L. Chuang, Cambridge University Press, 10th Anniversary Edition, 2010.
5. University Physics with Modern Physics, H.D. Young & R.A. Freedman, Pearson Education, 14/e, 2015.

Web Links (Online Source):

1. https://nptel.ac.in/courses/115105537
2. https://nptel.ac.in/courses/106106232
3. https://nptel.ac.in/courses/108106181
4. https://nptel.ac.in/courses/106106232
5. https://nptel.ac.in/courses/115105131

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**2**	**3**	**1**	**2**	**2**					**1**		**2**	**3**	**2**	**1**
CO2	**3**	**3**	**2**	**2**	**2**					**1**		**2**	**3**	**2**	**2**
CO3	**3**	**3**	**3**	**2**	**3**	**1**	**2**			**1**		**2**	**3**	**3**	**2**
CO4	**3**	**3**	**3**	**2**	**3**	**2**			**1**	**1**		**3**	**3**	**3**	**3**
CO5	**3**	**3**	**2**	**2**	**3**	**2**	**2**			**1**		**3**	**3**	**3**	**3**
CO*	**2.8**	**3.0**	**2.2**	**2.0**	**2.6**	**1.7**	**2.0**		**1.0**	**1.0**		**2.4**	**3.0**	**2.6**	**2.2**

Level: 3 – High, 2 – Moderate, 1 - Low

26SOTT1702	Linear Algebra & Multivariable Calculus (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		3	1	0	4

Prerequisite: Basic knowledge of higher secondary school mathematics (matrices, differentiation and integration).

Course Description:

This course is about the basic mathematics that is fundamental and an essential component in all streams of undergraduate studies in sciences and engineering. The course consists of topics in matrices, quadratic forms, mean value theorems, multivariable calculus and multiple integrals with applications to various engineering problems.

Course Objectives: The course should enable the students to:

1. Instruct the concept of Matrices in solving linear algebraic equations, Eigen values and Eigen vectors.
2. Familiarize the techniques in Vector differential operators.
3. Understand the maxima and minima of functions of single and several variables.
4. Illuminate the students in the concept of finding areas and volumes.
5. Equip the students with standard concepts and tools at an intermediate to advanced level of mathematics to develop the confidence and ability to handle various real-world problems and their applications.

Unit - I	Matrices and System of Linear Equations	12 Hrs

Matrices: Rank of a matrix by echelon form, normal forms. System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss Elimination method, Gauss Seidel Iteration Method. Eigen values, Eigen vectors of Matrices, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem.

Unit - II	Mean Value Theorems	12 Hrs

Rolle's Theorem, Lagrange's Mean Value Theorem, Cauchy's Mean Value Theorem, Taylor's and Maclaurin's Theorems with remainders (without proof); Properties and Problems.

Unit - III	Vector Differentiation	12 Hrs

Scalar and vector point functions, vector operator del, Gradient, Divergence and Curl and vector identities, directional derivative, Solenoidal vector and curl of a vector. Application: Potential surfaces.

Unit - IV	Partial Differentiation and Applications (Multivariable Calculus)	12 Hrs

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Unit - V	Multiple Integrals (Multivariable Calculus)	12 Hrs

Double integrals, change of order of integration, double integration in polar coordinates, areas enclosed by plane curves. Evaluation of triple integrals, change of variables between Cartesian and spherical polar coordinates.

Total Hours	60 Hrs

Course Outcomes:	POs	PSOs	Peak BTL
1. Analyze the solutions of systems of linear equations and determine the Eigen values and Eigen vectors of a matrix to study the long-term behaviour of a system.	PO1, PO2	1	4
2. Analyze conservative and solenoidal vector fields using vector differential operators.	PO1, PO2	1	4
3. Apply mean value theorems to solve real-life problems.	PO1, PO2	2	3

4. Apply the concepts of functions of several variables to solve optimization problems.	PO1, PO2	**1**	**3**
5. Evaluate multiple integrals in various coordinate systems and apply them to compute areas and volumes.	PO1, PO2, PO5	**1,2**	**3**

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons Publishers, New Edition.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Edition.

Reference Books:

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas' Calculus, 13/e, Pearson Publishers, 2013.
3. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson Publishers, 2012.

Web Links (Online Source):

1. https://nptel.ac.in/courses/111107108
2. https://www.slideshare.net/ItishreeDash3/a-study-on-multivariable-calculus-and-its-applications

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**2**											**1**		
CO2	**3**	**3**											**1**		
CO3	**3**	**3**												**1**	
CO4	**3**	**2**											**1**		
CO5	**3**	**3**			**2**								**2**	**1**	
CO*	**3.0**	**2.6**			**2.0**								**1.2**	**1.0**	

Level: 3 – High, 2 – Moderate, 1 - Low

26SOTT1801	Programming for Problem Solving (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		3	1	0	4

Prerequisite: Basic knowledge of computer fundamentals.

Course Description:

Programming for Problem Solving Using C is a foundational computer science course that introduces students to computational thinking, algorithm design and the C programming language. This course provides students with a strong understanding of programming fundamentals, control structures, data structures and modular programming necessary for solving real-world computational problems.

Course Objectives:

1. To understand the fundamental concepts of computer programming, algorithms and flowcharts for problem solving.
2. To learn the syntax and semantics of the C programming language, including data types, operators and control structures.
3. To design and implement programs using arrays, strings, functions and recursion.
4. To understand pointers, structures, unions and dynamic memory allocation for efficient programming.
5. To apply file handling and preprocessor directives to develop complete C programs for real-world problems.

Unit - I	Introduction to Programming and C Fundamentals	12 Hrs

Introduction to Computers and Programming: Algorithms, Pseudocode, Flowcharts; Introduction to C: History and Features, Structure of a C Program, Character Set, Keywords and Identifiers, Data Types, Variables and Constants, Operators and Expressions, Type Conversion, Input and Output Statements, Compilation and Execution of a C Program.

Unit - II	Control Structures	12 Hrs

Decision Making Statements: if, if-else, nested if-else, switch-case, Looping Statements: while, do-while, for, Nested Loops, Jump Statements: break, continue, goto, Writing Programs Using Control Structures for Problem Solving.

Unit - III	Arrays, Strings and Functions	12 Hrs

Arrays: One-Dimensional and Two-Dimensional Arrays, Array Operations; Strings: String Handling Functions, String Manipulation Programs; Functions: User-Defined Functions, Function Prototypes, Parameter Passing, Scope and Storage Classes, Recursion and its Applications.

Unit - IV	Pointers, Structures and Unions	12 Hrs

Pointers: Pointer Declaration and Initialization, Pointer Arithmetic, Pointers and Arrays, Pointers and Functions, Dynamic Memory Allocation; Structures: Defining and Using Structures, Arrays of Structures, Nested Structures; Unions: Definition and Usage.

Unit - V	File Handling and Preprocessor Directives	12 Hrs

File Handling: Opening, Reading, Writing and Closing Files, Sequential and Random Access Files; C Preprocessor: Macros, File Inclusion, Conditional Compilation; Command Line Arguments; Case Studies on Problem Solving Using C.

Total Hours	60 Hrs

Course Outcomes:	POs	PSOs	Peak BTL
1. Understand basic problem-solving techniques, algorithms, flowcharts and the fundamentals of the C programming language.	PO1, PO2, PO12	1,2,3	2

2. Apply control structures and looping statements to develop C programs for computational problems.	PO1, PO2	**1,2,3**	**3**
3. Analyze problem requirements and design C programs using arrays, strings, functions and recursion.	PO1, PO2, PO3	**1,2,3**	**4**
4. Analyze memory and data organization requirements to develop efficient and modular C programs using pointers, structures and unions.	PO1, PO2, PO3	**1,2,3**	**4**
5. Evaluate and develop complete C programs employing file handling and preprocessor directives to solve real-world computational problems.	PO1, PO2, PO3, PO4, PO12	**1,2,3**	**5**

Text Books:

1. Programming in ANSI C, E. Balagurusamy, 8/e, 2019, McGraw Hill Education, New Delhi, India.
2. The C Programming Language, Brian W. Kernighan and Dennis M. Ritchie, 2/e, Prentice Hall.

Reference Books:

1. Let Us C, Yashavant Kanetkar, 17/e, 2020, BPB Publications, New Delhi, India.
2. C: The Complete Reference, Herbert Schildt, 4/e, 2000, Tata McGraw Hill.
3. Programming with C, Byron Gottfried, Schaum's Outline Series, 4/e, McGraw Hill.
4. Data Structures Using C, Reema Thareja, 2/e, Oxford University Press.
5. Computer Programming, V. Rajaraman, 2/e, PHI Learning.

Web Links (Online Source):

1. https://nptel.ac.in/courses/106105171
2. https://www.programiz.com/c-programming

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**1**										**1**	**3**	**1**	**1**
CO2	**3**	**2**											**3**	**1**	**1**
CO3	**3**	**2**	**2**										**3**	**1**	**2**
CO4	**3**	**2**	**2**										**3**	**1**	**2**
CO5	**2**	**3**	**3**	**1**								**1**	**3**	**2**	**3**
CO*	**2.8**	**2.0**	**2.3**	**1.0**								**1.0**	**3.0**	**1.2**	**1.8**

Level: 3 – High, 2 – Moderate, 1 – Low

26TAUT1101	Communicative English (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		3	0	0	3

Prerequisite: Nil.

Course Description:

This course develops students' English language proficiency through integrated learning in vocabulary, grammar, speaking, reading, and writing. It enhances academic and professional communication through interactive activities while strengthening critical reading, structured writing, and prompt engineering skills for higher education and career readiness.

Course Objectives:

1. Develop learners' vocabulary, grammar, and reading skills for effective academic and professional communication.
2. Enhance oral communication through structured speaking activities, presentations, and collaborative discussions.
3. Strengthen writing skills by producing clear, coherent, and professionally appropriate written texts.
4. Foster critical reading, analytical thinking, and language accuracy using authentic and contextual learning materials.
5. Prepare students for workplace communication by integrating digital communication practices with language proficiency.

Unit - I	Foundations of Vocabulary, Speaking, Reading, Writing and Grammar	9 Hrs

Vocabulary: Technical Vocabulary, Formal and Informal Functional Vocabulary, Synonyms, Antonyms, Affixes (Prefixes/Suffixes). Speaking: The LinkedIn Pitch Video – recording a 60-second professional self-introduction video, mentioning a skill being built and a career goal, building personal branding and camera confidence. Reading: Skimming for the Main Idea; Scanning for Specific Information. Writing: Mechanics of Writing – Importance of Proper Punctuation, Techniques for Writing Precisely. Grammar: Parts of Speech, Basic Sentence Structures – Forming Questions.

Unit - II	Cohesion, Structured Speaking and Paragraph Writing	9 Hrs

Vocabulary: Homonyms, Homophones, Homographs, Root Words. Speaking: Podcast Shadowing Exercise – listening to a professional podcast/TED Talk segment and repeating sentences aloud to build tone, pace and confidence, with weekly reflective practice. Reading: Identifying Sequences of Ideas; Recognizing Cohesive Devices (Linkers) that Connect Ideas in a Paragraph. Writing: Structure of a Paragraph – Paragraph Writing on Specific Topics. Grammar: Use of Articles and Zero Articles; Prepositions.

Unit - III	Inference, Summarization and Grammatical Accuracy	9 Hrs

Vocabulary: Compound Words, Collocation. Speaking: Discussing Specific Topics in Pairs or Small Groups and Reporting the Discussion. Reading: Reading a Text in Detail by Making Basic Inferences; Recognizing and Interpreting Context Clues (Newspaper Texts). Writing: Note-Making, Summarizing and Paraphrasing. Grammar: Verbs – Tenses; Subject-Verb Agreement.

Unit - IV	Professional Writing and Extempore Communication	9 Hrs

Vocabulary: Words Often Confused, Words from Foreign Languages Used in Everyday Communication. Speaking: Extempore Speech. Reading: Jumbled Sentences. Writing: Letter Writing – Official Letters, Email Writing. Grammar: Redundancies and Clichés in Written Communication.

Unit - V	Formal Presentations and Structured Essay Writing	9 Hrs

Vocabulary: Technical Jargon, One-Word Substitutions. Speaking: Formal Oral Presentations on Academic Topics. Reading: Reading Comprehension (Diagnostic Text). Writing: Writing Structured Essays on Specific Topics. Grammar: Active and Passive Voice.

Total Hours			**45 Hrs**
Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Use appropriate vocabulary and grammatical structures to communicate accurately in academic and professional contexts.	PO1, PO10, PO12	**1**	**3**
2. Demonstrate effective oral communication skills through self-introductions, discussions, extempore speeches, and formal presentations.	PO9, PO10, PO12	**1,2**	**3**
3. Apply reading strategies to comprehend, interpret, summarize, and infer information from diverse texts.	PO1, PO2, PO10, PO12	**1**	**4**
4. Produce well-organized paragraphs, letters, emails, notes, summaries, and essays using appropriate writing conventions.	PO1, PO10, PO12	**1,2**	**3**
5. Demonstrate professional communication skills by integrating language proficiency with digital and workplace communication practices.	PO5, PO8, PO9, PO10, PO12	**1,2,3**	**3**

Text Books:

1. Board of Editors, Fluency in English: A Course Book for Engineering and Technology, Orient Blackswan, Hyderabad, 2016.
2. Raman, Meenakshi and Sharma, Sangeetha, Technical Communication: Principles and Practice, Oxford University Press, New Delhi, 2014.

Reference Books:

1. Dubey, Sham Ji and Co., English for Engineers, Vikas Publishers, 2020.
2. Bailey, Stephen, Academic Writing: A Handbook for International Students, Routledge, 2014.
3. Murphy, Raymond, English Grammar in Use, 4/e, Cambridge University Press, 2019.
4. Lewis, Norman, Word Power Made Easy: The Complete Handbook for Building a Superior Vocabulary, Anchor, 2014.

Web Links (Online Source):

1. https://dictionary.cambridge.org/
2. https://learnenglish.britishcouncil.org/grammar
3. https://readtheory.org/
4. https://www.ted.com/talks

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2									3		1	2		
CO2									2	3		2	2	1	
CO3	3	2								1		2	2		
CO4	1									3		1	2	1	
CO5					1			1	2	3		2	3	2	1
CO*	2.0	2.0			1.0			1.0	2.0	2.6		1.6	2.2	1.3	1.0

Level: 3 – High, 2 – Moderate, 1 - Low

26SOTL1701	**Engineering Physics Lab** **(Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**

Prerequisite: Nil.

Course Description:

The aim of this course is to make students gain practical knowledge to co-relate with the theoretical studies and to develop practical applications of engineering materials and use the principle in the right way to implement modern technology.

Course Objectives:

1. Understand the importance of Physics through hands-on laboratory experiments and appreciate its role in engineering and technology.
2. Understand the principles and operation of optical, semiconductor, and electronic devices through experimental investigations.
3. Develop scientific thinking by correlating observations, experimental results, and theoretical concepts to understand physical phenomena and their engineering applications.
4. Gain hands-on experience with modern scientific tools and techniques, such as LASERs, optical fibers, and semiconductor characterization methods.
5. Develop analytical, teamwork, scientific communication, and technical reporting skills through collaborative experimentation, data analysis, and interpretation of result

List of Experiments:

Exp. No	**Title of the Experiment**	**COs**
1	Determination of Acceleration Due to Gravity Using a Compound Pendulum.	CO1
2	Study of Vibrations in a Stretched String Using Melde's Experiment	CO2
3	Study of Resonance in an LCR Circuit.	CO2, CO5
4	Determination of the Thickness of a Thin Wire Using the Wedge-Shaped Film Method.	CO2
5	1Determination of the Radius of Curvature of a Plano-Convex Lens Using Newton's Rings.	CO2, CO3
6	Determination of the Wavelength of Laser Light Using a Diffraction Grating.	CO4
7	Determination of the Numerical Aperture and Acceptance Angle of an Optical Fiber.	CO4
8	Determination of the Energy Band Gap of a Semiconductor.	CO3
9	Study of the Current–Voltage (I–V) Characteristics of a p–n Junction Diode.	CO3
10	Study of the Current–Voltage (I–V) Characteristics of a Solar Cell.	CO3, CO5
Total Hours		**30 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Develop analytical/experimental skills and impart prerequisite hands-on experience for engineering laboratories.	PO1, PO2, PO5, PO9, PO10, PO12	**1,2,3**	**3**
2. Understand the need for precise measurement practices for data recording.	PO1, PO2, PO4, PO5, PO10, PO12	**1,2,3**	**2**

3. Understand the principle, concept, working and applications of relevant technologies and comparison of results with theoretical calculations.	PO1, PO2, PO3, PO4, PO5, PO10, PO12	**1,2,3**	**4**
4. Analyze the techniques and skills associated with modern scientific tools such as lasers and fiber optics.	PO1, PO2, PO3, PO4, PO5, PO10, PO12	**1,2,3**	**4**
5. Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.	PO1, PO4, PO9, PO10, PO12	**1,2,3**	**3**

Text Books:

1. Engineering Physics, M.N. Avadhanulu, P.G. Kshirsagar & T.V.S. Arun Murthy, 11/e, 2018, S. Chand & Company Ltd.
2. Optics, Ajoy Ghatak, 7/e, 2017, McGraw Hill Education (India) Private Limited.
3. Engineering Physics, H.K. Malik & A.K. Singh, 2/e, 2018, McGraw Hill Education (India) Private Limited.

Reference Books

1. Experiments in Engineering Physics, M.N. Avadhanulu, A.A. Dani & P.M. Pokley, S. Chand & Company Ltd., 2008.
2. Engineering Physics Practicals, S.K. Gupta, Krishna Prakashan Media Pvt. Ltd., 2014.
3. Practical Physics with Viva Voce, S.L. Gupta & V. Kumar, Pragati Prakashan Publishers, Revised Edition, 2009.
4. Practical Physics, P.R. Sasikumar, PHI Learning Pvt. Ltd., 2011.

Web Links (Online Source):

6. https://ep-iitb.vlabs.ac.in/
7. https://www.vlab.co.in/

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2		3	3				2	1		2	3	2	1
CO2	3	3		3	2					1		2	3	2	1
CO3	3	3	1	3	2					1		2	3	3	2
CO4	3	3	2	3	3					1		2	2	3	3
CO5	1			1					3	3	2	2	2	2	3

Level: 3 – High, 2 – Moderate, 1 - Low

26SOTL1801	Programming for Problem Solving Lab (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		0	0	2	1

Prerequisite: Basic knowledge of computer fundamentals.

Course Description:

This laboratory course complements Programming for Problem Solving Using C by providing hands-on practice in algorithm design and C programming. Students write, debug and execute C programs covering control structures, arrays, strings, functions, recursion, pointers, structures, unions and file handling, building the practical skills needed to solve computational problems.

Course Objectives:

1. To implement algorithms and flowcharts as working C programs to solve computational problems.
2. To practice writing C programs using decision-making and looping statements.
3. To develop programs using arrays, strings, functions and recursion.
4. To implement programs using pointers, structures, unions and dynamic memory allocation.
5. To develop C programs involving file handling to solve real-world problems.

List of Experiments:

Exp. No	Title of the Experiment	COs
1	Study of C programming environment; write and execute simple programs using basic input/output statements and operators.	CO1
2	Programs using decision-making statements: if, if-else, nested if-else and switch-case.	CO1, CO2
3	Programs using looping statements: while, do-while and for, including nested loops.	CO2
4	Programs on one-dimensional arrays: searching, sorting and basic array operations.	CO2, CO3
5	Programs on two-dimensional arrays: matrix addition, multiplication and transpose.	CO3
6	Programs on string handling functions and string manipulation.	CO3
7	Programs using user-defined functions with and without arguments and return values.	CO3
8	Programs using recursion to solve problems such as factorial, Fibonacci series and GCD.	CO3
9	Programs using pointers and pointer arithmetic, including pointers with arrays and functions.	CO4
10	Programs using structures and unions to represent and manipulate real-world records.	CO4
11	Programs using dynamic memory allocation (malloc, calloc, realloc, free).	CO4
12	Programs using file handling operations to read from and write to files.	CO5
Total Hours		**30 Hrs**

Course Outcomes:	POs	PSOs	Peak BTL
1. Write and execute simple C programs using basic input/output statements and operators.	PO1, PO2, PO5	**1,2,3**	**3**
2. Apply control statements and looping constructs to develop C programs for computational problems.	PO1, PO2, PO5	**1,2,3**	**3**

3. Analyze problem requirements and design C programs using arrays, strings, functions and recursion.	PO1, PO2, PO3, PO5	**1,2,3**	**4**
4. Analyze memory and data organization requirements to implement C programs using pointers, structures, unions and dynamic memory allocation.	PO1, PO2, PO3, PO5	**1,2,3**	**4**
5. Evaluate and develop complete C programs employing file handling to solve real-world computational problems.	PO1, PO2, PO3, PO4, PO5, PO12	**1,2,3**	**5**

Reference Books:

1. Let Us C, Yashavant Kanetkar, 17/e, 2020, BPB Publications, New Delhi, India.
2. C: The Complete Reference, Herbert Schildt, 4/e, 2000, Tata McGraw Hill.
3. Programming with C, Byron Gottfried, Schaum's Outline Series, 4/e, McGraw Hill.
4. Data Structures Using C, Reema Thareja, 2/e, Oxford University Press.
5. Problem Solving and Program Design in C, Jeri R. Hanly and Elliot B. Koffman, 8/e, Pearson.

Web Links (Online Source):

1. https://nptel.ac.in/courses/106105171
2. https://www.programiz.com/c-programming

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**1**			**2**								**3**	**1**	**1**
CO2	**3**	**2**			**2**								**3**	**1**	**1**
CO3	**3**	**2**	**2**		**2**								**3**	**1**	**2**
CO4	**3**	**2**	**2**		**2**								**3**	**1**	**2**
CO5	**2**	**3**	**3**	**1**	**2**							**1**	**3**	**2**	**3**
CO*	**2.8**	**2.0**	**1.4**	**1.0**	**2.0**							**1.0**	**3.0**	**1.2**	**1.8**

Level: 3 – High, 2 – Moderate, 1 - Low

26SOTL1802	IT Workshop (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		0	0	2	1

Prerequisite: Nil. Basic familiarity with computers is helpful but not mandatory.

Course Description:

IT Workshop is a hands-on laboratory course that introduces students to PC hardware assembly and troubleshooting, operating system installation and configuration (Windows and Linux), Internet technologies and cybersecurity practices, and essential office productivity tools (Word, Excel, PowerPoint). Through structured tasks and practical exercises, students build the digital literacy, technical troubleshooting, and collaborative computing skills needed for academic and professional environments.

Course Objectives:

1. Understand computer hardware components and troubleshooting techniques.
2. Install and configure Windows and Linux operating systems.
3. Develop skills in Internet usage, cybersecurity and responsible digital practices.
4. Create professional documents, spreadsheets and presentations using productivity tools.
5. Develop digital literacy and collaborative computing skills for academic and professional environments.

List of Experiments:

Exp. No	Title of the Experiment	COs
1	PC Hardware: Identify computer peripherals, motherboard components and CPU architecture; prepare a labelled block diagram.	CO1
2	PC Hardware & Internet: Install Windows 11 and perform basic configuration (BIOS/UEFI settings, boot sequence, SSD/HDD identification, RAM installation); configure LAN and TCP/IP settings and access the Internet.	CO2, CO3
3	PC Hardware: Install Ubuntu Linux using Dual Boot or VirtualBox/VMware.	CO2
4	Internet & WWW: Use search engines effectively and practice Netiquette.	CO3
5	Internet & WWW: Practice Cyber Hygiene including phishing awareness, MFA, password security and safe browsing.	CO5
6	Word Processing: Word orientation and document formatting.	CO4
7	Word Processing: Create a project certificate using SmartArt, Watermark, References, Captions and the Accessibility Checker.	CO4
8	Word Processing: Create a project abstract using SmartArt, Watermark, References, Captions and the Accessibility Checker.	CO4
9	Word Processing: Create a newsletter using SmartArt, Watermark, References, Captions and the Accessibility Checker.	CO4
10	LaTeX: Prepare a technical document (report/project abstract) using LaTeX, including sections, references, tables and equations.	CO4
11	Excel: Perform GPA calculation using formulas such as IF, SUMIF and COUNTIF.	CO4
12	Excel: Practice sorting, filtering, conditional formatting, Data Validation and Pivot Tables.	CO4
13	PowerPoint: Develop an interactive presentation.	CO4
14	PowerPoint: Prepare slides using AI tools	CO5
Total Hours		**60 Hrs**

Course Outcomes:	POs	PSOs	Peak BTL
1. Identify computer hardware components, motherboard architecture and CPU organization, and represent system configurations using block diagrams.	PO1, PO5	**1**	**2**
2. Install and configure Windows and Linux operating systems, including BIOS/UEFI settings, boot configuration and storage/RAM setup.	PO1, PO2, PO5	**1**	**3**
3. Configure Internet connectivity and use web browsers and search tools effectively and responsibly.	PO1, PO5, PO8, PO12	**1**	**3**
4. Create professional documents (including LaTeX-based technical documents), spreadsheets and presentations using office productivity tools.	PO1, PO5, PO10	**1,2**	**4**
5. Apply cybersecurity awareness practices and utilize AI-based digital tools for effective information management.	PO1, PO5, PO8, PO12	**1,2,3**	**4**

Reference Books:

1. Comdex Information Technology Course Tool Kit, Vikas Gupta, Wiley Dreamtech.
2. Introduction to Information Technology, ITL Education Solutions, Pearson.
3. PC Hardware – A Handbook, Kate J. Chase.
4. IT Essentials PC Hardware and Software Labs and Study Guide, Cisco Press.
5. Joan Lambert, Microsoft Office 365 Step by Step (Recommended).
6. Andrew S. Tanenbaum, Computer Networks (Recommended).
7. LaTeX Companion, Leslie Lamport.

Web Links (Online Source):

1. https://nptel.ac.in/courses/106106248 (Cyber Security and Privacy, IIT Madras)
2. https://ubuntu.com/tutorials/install-ubuntu-desktop
3. https://support.microsoft.com/en-us/office
4. https://learn.microsoft.com/en-us/deployoffice/
5. https://prosselloe.wordpress.com/2017/05/06/cisco-it-essentials-virtual-desktop/

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**				**1**								**3**		
CO2	**3**	**1**			**3**								**2**		
CO3	**2**				**2**			**1**				**1**	**3**		
CO4	**2**				**3**					**2**			**1**	**1**	
CO5	**2**				**2**			**2**				**1**	**1**	**2**	**1**
CO*	**2.4**	**1**			**2.2**			**1.5**		**2**		**1**	**2**	**1.5**	**1**

Level: 3 – High, 2 – Moderate, 1 – Low

26SOTL1901	Design Thinking Lab (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		0	0	2	1

Prerequisite: Nil.

Course Description:

This laboratory/activity-based course provides hands-on practice in Design Thinking, creative problem-solving, product development, strategic innovation, and Agile methodologies. Students apply the Design Thinking process, engineering product design principles, and Agile practices such as Scrum, Kanban, and Minimum Viable Product (MVP) development through structured activities and case studies to solve practical engineering and business problems and develop innovative, user-centered solutions.

Course Objectives:

1. Understand the fundamental concepts of Design Thinking, learning styles, product development, and innovation.
2. Apply the stages, tools, and techniques of the Design Thinking process for creative problem-solving and idea development.
3. Understand engineering product design processes and apply Design Thinking approaches to product development and Information Technology applications.
4. Analyze the role of Design Thinking, creativity, innovation, and strategic innovation in addressing engineering and business challenges.
5. Apply Agile principles, Scrum, Kanban, iterative development, and customer feedback approaches for developing innovative and user-centered products.

List of Experiments:

Exp. No	Title of the Experiment	COs
1	Identify a real-world problem and a potential product development opportunity; present a discussion on a successful or innovative product.	CO1
2	Study Kolb's Learning Styles and the product development process; prepare a product planning document for the identified opportunity.	CO1
3	Present an innovative idea in three minutes and represent the Design Thinking process (Empathize, Define, Ideate, Prototype, Test) using a flow diagram/flowchart.	CO2
4	Apply Design Thinking tools (empathy map, brainstorming, mind mapping) to generate and shortlist ideas for the chosen problem.	CO2
5	Set product specifications and build/present an individual product design concept or prototype.	CO3
6	Prepare a case study on the application of Design Thinking to product design in an Information Technology/engineering context.	CO3
7	Develop a marketing strategy and analyze the maintenance and reliability aspects of the proposed product.	CO4
8	Prepare a basic start-up plan applying strategic innovation and Design Thinking-business linkage concepts.	CO4
9	Prepare a basic Sprint Plan and represent the product backlog using a Kanban board for the proposed product.	CO5
10	Develop a Minimum Viable Product (MVP) concept, collect customer/peer feedback, and iteratively improve the proposed product using Agile principles.	CO5
Total Hours		**30 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**

1. Explain the fundamental concepts of Design Thinking, learning styles, product development, and innovation.	PO1, PO2	**PSO1**	**2**
2. Apply the stages, tools, and creative problem-solving techniques of the Design Thinking process to identify and address real-world problems.	PO1, PO2, PO3	**PSO1, PSO2**	**3**
3. Develop engineering product concepts by applying product design processes and Design Thinking approaches.	PO2, PO3, PO5	**PSO1, PSO2**	**5**
4. Analyze the role of creativity, innovation, and Design Thinking in addressing strategic engineering and business challenges.	PO2, PO3, PO11	**PSO2**	**4**
5. Apply Agile principles, Scrum, Kanban, MVP, and customer feedback approaches to develop and iteratively improve innovative, user-centered products.	PO3, PO5, PO9, PO11	**PSO1, PSO2**	**3**

Reference Books:

1. E. Balagurusamy, Developing Thinking Skills: The Way to Success, Khanna Book Publishing Company, 2022.
2. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, Harper Business, 2009.
3. Idris Mootee, Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School, Wiley, 2013.
4. Hasso Plattner, Christoph Meinel and Larry Leifer, Design Thinking: Understand – Improve – Apply, Springer, 2011.
5. Tom Kelley and David Kelley, Creative Confidence: Unleashing the Creative Potential Within Us All, Crown Business, 2013.

Web Links (Online Source):

1. https://nptel.ac.in/courses/110106124
2. https://nptel.ac.in/courses/107101088
3. https://designthinking.ideo.com/
4. https://dschool.stanford.edu/innovate/tools
5. https://www.ibm.com/training/enterprise-design-thinking

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**2**											**3**		**3**
CO2	**2**	**3**	**3**										**3**	**2**	**3**
CO3		**2**	**3**		**3**								**3**	**3**	**3**
CO4		**3**	**2**								**3**			**3**	
CO5			**3**		**3**				**2**		**2**		**2**	**3**	**2**
CO*	**2.5**	**2.0**	**2.75**		**3**				**2**		**2.5**		**2.75**	**2.75**	**2.75**

Level: 3 – High, 2 – Moderate, 1 – Low

26SOTL1902	Communicative English Language Lab (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		0	0	2	1

Prerequisite: Nil.

Course Description:

The Communicative English Language Laboratory course develops students' listening and speaking skills through interactive and technology-enabled learning. It focuses on pronunciation, phonetics, functional communication, presentations, and collaborative learning using speech analysis software, online dictionaries, AI-assisted language learning tools, role plays, TED Talks, and group discussions to enhance academic and professional communication skills.

Course Objectives:

1. Develop accurate pronunciation and phonetic skills for effective spoken communication.
2. Enhance listening and speaking proficiency through interactive communication activities.
3. Build fluency and confidence in using English in academic, social, and professional contexts.
4. Strengthen presentation, interpersonal, and collaborative communication skills.
5. Utilize digital resources and AI-assisted language learning tools to improve English language proficiency.

List of Experiments:

Exp. No	Title of the Experiment	COs
1	**Phonetics and Pronunciation:** Organs of Speech, Vowels, Consonants, Diphthongs, Syllable Division, Word Stress, Intonation, and Phonetic Transcription, with the support of speech analysis software, online dictionaries, and AI-assisted language learning tools.	CO1
2	**Functional Communication:** Speaking about the Past, Present and Future; Role Plays – Language Functions: Greetings, Requests, Expressing Opinions and Negotiations; Asking for and Giving Directions.	CO2
3	**Descriptive Speaking:** Describing an Object/ Situation/ Incident/ People/ Place/ Process.	CO3
4	**Presentation Skills:** Oral and PowerPoint Presentations.	CO4
5	**Listening and Collaborative Communication:** Listening to TED Talks, Group Discussions, and Debate.	CO5
Total Hours		**30 Hrs**

Course Outcomes:	POs	PSOs	Peak BTL
1. Produce intelligible English speech with appropriate pronunciation, stress, and intonation.	PO1, PO5, PO10, PO12	**1,2**	**3**
2. Participate effectively in situational and interpersonal conversations.	PO09, PO10, PO12	**1,2**	**3**
3. Speak coherently on familiar topics with improved fluency and vocabulary.	PO09,PO10, PO12	**1,2**	**3**
4. Deliver structured oral and PowerPoint presentations confidently.	PO5, PO9, PO10, PO12	**1,2,3**	**4**
5. Demonstrate active listening, collaboration, and critical response skills in discussions.	PO8,PO9, PO10, PO12	**1,2,3**	**4**

Reference Books:

1. Board of Editors, Fluency in English: A Course Book for Engineering and Technology, Orient Blackswan, Hyderabad, 2016.
2. Raman, Meenakshi and Sharma, Sangeetha, Technical Communication: Principles and Practice, Oxford University Press, New Delhi, 2014.
3. Dubey, Sham Ji & Co., English for Engineers, Vikas Publishers, 2020.
4. Bailey, Stephen, Academic Writing: A Handbook for International Students, Routledge, 2014.
5. Murphy, Raymond, English Grammar in Use, 4/e, Cambridge University Press, 2019.
6. Lewis, Norman, Word Power Made Easy: The Complete Handbook for Building a Superior Vocabulary, Anchor, 2014.

Web Links (Online Source):

1. https://www.internationalphoneticassociation.org/
2. https://learnenglish.britishcouncil.org/

Recommended Software:

3. Walden Infotech

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1				2					3		1	2	1	
CO2									2	3		2	3	2	
CO3									2	3		1	3	2	
CO4					1				2	3		2	3	2	1
CO5								1	3	3		2	3	2	1
CO*	1				1.5			1	2.75	3		1.6	2.8	1.8	1

Level: 3 – High, 2 – Moderate, 1 – Low

UNIVERSITY ELECTIVE-I

26TAUT1201A	BASICS OF HEALTH MANAGEMENT	L	T	P	C
		3	0	0	3

Course Description:

This course provides an essential foundation in health management, focusing on key areas such as basic life support, first aid, stroke management, and the prevention and management of both communicable and non-communicable diseases. Students will develop practical skills and knowledge to effectively manage health-related situations in various settings.

Course Objectives:

Students undergoing this course are expected to:

1. To understand the principles and techniques of basic life support.
2. To acquire essential first aid skills.
3. To comprehend the causes, symptoms, and management of stroke.
4. To learn about non-communicable diseases, their risk factors, and management strategies.
5. To understand communicable diseases, their transmission, prevention, and control.

Unit - I	Basic Life Support	9 Hrs
Overview of Basic Life Support (BLS), Cardiopulmonary Resuscitation (CPR) Techniques, Use of Automated External Defibrillators (AEDs), Airway Management and Breathing Support, BLS Protocols and Procedures		
Unit - II	**First Aid**	**9 Hrs**
Introduction to First Aid Principles, Managing Wounds and Bleeding, Fractures and Musculoskeletal Injuries, Burns and Scalds Treatment, Handling Medical Emergencies (e.g., heart attack, choking, seizures)		
Unit - III	**Stroke**	**9 Hrs**
Understanding Stroke: Types and Causes, Symptoms and Warning Signs of Stroke, Immediate Response and Management, Stroke Rehabilitation and Recovery, Prevention and Risk Reduction Strategies		
Unit - IV	**Non-Communicable Diseases**	**9 Hrs**
Definition and Classification of Non-Communicable Diseases (NCDs), Common NCDs: Cardiovascular Diseases, Diabetes, Cancer, Chronic Respiratory Diseases, Risk Factors and Prevention Strategies, Management and Treatment Approaches, Public Health Implications and Policy Responses		
Unit - V	**Communicable Diseases**	**9 Hrs**
Introduction to Communicable Diseases, Modes of Transmission and Epidemiology, Prevention and Control Measures (e.g., vaccination, hygiene, quarantine), Management of Common Communicable Diseases (e.g., TB, HIV/AIDS, Influenza), Emerging Infectious Diseases and Global Health Security		
Total Hours		**45 Hrs**

Course Outcomes:	POs	PSOs	Peak BTL
At the end of this course, students should be able to: 1. Perform basic life support techniques.	PO1, PO5	PSO1, PSO2	**L3**
2. Administer essential first aid.	PO1, PO5	PSO2	**L3**
3. Recognize and manage stroke symptoms and treatments.	PO1, PO3	PSO1	**L3**
4. Understand and address non-communicable diseases.	PO1, PO6	PSO1	**L2**
5. Implement communicable disease control measures.	PO6, PO7	PSO1	**L3**
Text Books: 1. "Basic Life Support Provider Manual" by American Heart Association 2. "First Aid Manual" by St. John Ambulance, St. Andrew's First Aid, and the British Red Cross			
Reference Books: 1. "Stroke: Practical Guide to Management" by Charles P. Warlow 2. "Non-Communicable Diseases in the Developing World" by Rachel Nugent 3. "Communicable Disease Control and Health Protection Handbook" by Jeremy Hawker et al.			

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**2**				**2**								**2**	**2**	
CO2	**2**				**2**									**2**	
CO3	**2**		**2**										**2**		
CO4	**2**					**2**							**2**		
CO5						**2**	**2**						**2**		
CO*	**2.0**		**2.0**		**2.0**	**2.0**	**2.0**						**2.0**	**2.0**	

Level: 3 - High, 2 - Moderate, 1 – Low

26TAUT1201B	BASIC EMERGENCY CARE AND LIFE SUPPORT SKILLS	L	T	P	C
		3	0	0	3

Course Description:

This course introduces students to the fundamental skills required for providing basic emergency care and life support. It covers essential techniques in CPR, AED use, and basic first aid to prepare students for real-life emergency situations.

Course Objectives:

Students undergoing this course are expected to:

1. To understand the principles and techniques of basic life support.
2. To acquire essential first aid skills.
3. To know the use of AED
4. To get trained in the practical aspects of CPR.
5. To know the various assessment aspects of a patient in an emergency

Unit - I	**Basic Life Support (BLS) and CPR**	**9 Hrs**
Introduction to BLS and CPR, Steps of Adult, Child, and Infant CPR, Airway Management, Rescue Breathing and Chest Compressions		
Unit - II	**Automated External Defibrillator (AED)**	**9 Hrs**
What is an AED? When and How to Use an AED, Safety Precautions, Different types of Defibrillators		
Unit - III	**Basic First Aid Techniques**	**9 Hrs**
Principles of First Aid, Managing Bleeding and Wounds, Fractures and Sprains, Burns and Scalds.		
Unit - IV	**Recognizing Medical Emergencies**	**9 Hrs**
Identifying Common Medical Emergencies, Initial Assessment and Response, Managing Breathing and Cardiac Emergencies.		
Unit - V	**Practical Skills Practice**	**9 Hrs**
Hands-on CPR Practice, AED Operation Drills, First Aid Skills Practice, Scenario-Based Training		
Total Hours		**45 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
At the end of this course, students should be able to: 1. Acquire a thorough knowledge of the principles and techniques of basic life support.	PO1	PSO1	**L1**
2. Apply essential first aid skills.	PO1, PO5	PSO1, PSO2	**L3**
3. Demonstrate the use of AED in Emergencies.	PO1, PO5	PSO2	**L3**
4. Demonstrate the practical aspects of CPR	PO1, PO5	PSO2	**L3**

5. Evaluate various assessment plans by the specific emergency.	PO2, PO4	PSO1	**L5**
Text Books: 1. "Basic Life Support Provider Manual" by American Heart Association 2. "First Aid Manual" by St. John Ambulance			

CO-POs/PSOs Mapping

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**2**												**2**		
CO2	**2**				**2**								**2**	**2**	
CO3	**2**				**3**									**3**	
CO4	**2**				**3**									**3**	
CO5		**2**		**2**									**2**		
CO*	**2.0**	**2.0**		**2.0**	**2.7**								**2.0**	**2.7**	

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT1201C	BIOSTATISTICS	L	T	P	C
		3	0	0	3

Course Description:

Biostatistics is the application of statistical methods to biological and health-related fields. This course provides a comprehensive introduction to the principles and techniques of biostatistics essential for conducting research in medicine, public health, and biology. Students will learn how to effectively collect, analyze, and interpret data from biological and health sciences, with a focus on understanding and addressing key issues such as experimental design, sampling methods, data visualization, hypothesis testing, and regression analysis.

Course Objectives:

1. Gain a solid understanding of biostatistical principles including descriptive statistics, probability, hypothesis testing, and regression analysis.
2. Apply these principles to analyze data from biological and health sciences, focusing on experimental and observational studies.
3. Critically interpret statistical results and effectively communicate findings to different audiences.
4. Develop proficiency in using statistical software for data manipulation, analysis, and visualization.
5. Design studies, evaluate literature, and collaborate in interdisciplinary teams, preparing for advanced study and research in biostatistics and related fields.

Unit - I	Descriptive methods	9 Hrs
Frequency Distribution, Characteristics of a Frequency Distribution, Tabular and Graphical Presentation of Data: Line Graphs, Bar Charts, Histograms, Ogives.		
Unit - II	**Measures of central tendency**	**9 Hrs**
Arithmetic Mean, Median, Mode, Position of Averages, Selection of the Appropriate Measure of Central Tendency, Geometric Mean, Harmonic Mean.		
Unit - III	**Measures of dispersion**	**9 Hrs**
Range, Interquartile Range, Mean Deviation, Variance and Standard Deviation		
Unit - IV	**Sampling Designs**	**9 Hrs**
Sampling and Sample Designs, Significance of Probability and Non-probability sampling methods, Crossover Design, Case Control Design, Cohort Study Design, Designing clinical trials - Single- and Double-Blind Experiments.		
Unit - V	**Data analysis and interpretation**	**9 Hrs**
Tests of hypothesis, Tests of significance, chi-square test, Goodness of fit, Analysis of variance.		
Total Hours		**45 Hrs**

Course Outcomes:	POs	PSOs	Peak BTL

1. Ability to design experiments, sampling variables, analyze the biological data, interpret and present the results in meaningful way.	PO1, PO4, PO5	PSO1, PSO2	**L4**
2. Create tables and graphs for data presentation	PO5	PSO2	**L3**
3. Describe measures of central tendency and dispersion along with calculating probability features of experiments.	PO1, PO2	PSO1	**L2**
4. Discuss the correlation between various types of data along with associated variables.	PO2, PO4	PSO1	**L3**
5. Test hypothesis and carry out related statistical tests	PO2, PO4	PSO1, PSO2	**L3**

Text Books:

1. Daniel WW, Cross CL (2013) Biostatistics: A Foundation Sciences
2. Biostatistics: A Foundation for Analysis in the Health Sciences, 11th Edition Chad L. Cross, Wayne W. Daniel, ISBN: 978-1-119-49657-1, December 2018

Reference Books:

1. Forthofer RN, Lee ES, Hernandez M (2006) To Design, Analysis, and Discovery. Elsevier Ltd., Amsterdam.
2. Principles of Biostatistics, 3rd Edition, By Marcello Pagano, Kimberlee Gauvreau, Heather Mattie (2022).

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**			**3**	**2**								**2**	**2**	
CO2					**3**									**3**	
CO3	**2**	**2**											**2**		
CO4		**2**		**2**									**2**		
CO5		**3**		**2**									**2**	**2**	
CO*	**2.5**	**2.3**		**2.3**	**2.5**								**2.0**	**2.3**	

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT1201D	ORGANIC FARMING	L	T	P	C
		3	0	0	3

Course Description:

By the end of the course, students will be equipped with the knowledge and skills to plan, establish, and manage organic farms effectively. This course serves as a foundation for aspiring organic farmers, agricultural professionals, and individuals interested in sustainable food production and environmental conservation.

Course Objectives:

1. To Understand the principles and practices of organic farming.
2. To Analyze the environmental, economic, and social implications of conventional versus organic agricultural systems.
3. To Apply organic farming techniques to enhance soil health and fertility.
4. To Examine the certification processes and regulations governing organic farming.
5. To explore ways to engage with local communities and promote organic practices.

Unit - I		9 Hrs

Introduction to Organic Farming, Overview of organic farming principles and practices, Historical development and evolution of organic agriculture, Importance of organic farming in sustainable agriculture, Comparison between conventional and organic farming systems, Certification and regulatory requirements for organic farming.

Unit - II		9 Hrs

Soil Health and Management, Importance of soil health in organic farming, Soil composition and structure, Soil fertility management without synthetic inputs, Soil conservation techniques: cover cropping, crop rotation, mulching, Composting and vermicomposting for organic matter enrichment.

Unit - III		9 Hrs

Crop Management in Organic Systems, Selection of suitable crops for organic farming, Organic seed selection, saving, and sourcing, Crop planning and rotation strategies, Weed management without herbicides: mechanical, cultural, and biological control methods, Pest and disease management in organic systems: integrated pest management (IPM), biological control, and natural remedies.

Unit - IV		9 Hrs

Organic Livestock Management, Principles of organic livestock production, Organic feed sourcing and formulation, Housing and space requirements for organic livestock, Health care and disease management without antibiotics and synthetic chemicals, Organic certification requirements for livestock operations.

Unit - V		9 Hrs

Marketing and Economics of Organic Farming, Market trends and consumer demand for organic products, Certification and labeling requirements for organic products, Marketing strategies for organic farmers: direct sales, farmers markets, CSA (Community Supported Agriculture), Economic viability and profitability of organic farming, Government support programs and incentives for organic farmers.

Total Hours			**45 Hrs**
Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
Upon completion of the course the student shall be able to, 1. Demonstrate a comprehensive understanding of the principles of organic farming and their application in agricultural systems.	PO1, PO7	PSO1	**L2**
2. Critically evaluate the sustainability of different agricultural practices, considering environmental impact, economic viability, and social equity.	PO4, PO7	PSO1	**L5**
3. Design and implement an organic farming plan for a specific crop or agricultural enterprise.	PO3, PO5	PSO2	**L6**
4. Analyze case studies and research articles to assess the effectiveness of organic farming practices in various contexts.	PO4, PO12	PSO1	**L4**
5. Communicate effectively about organic farming principles and practices, both orally and in writing.	PO10	PSO3	**L3**
Text Books: 1. "Teaming with Microbes: The Organic Gardener's Guide to the Soil Food Web" by Jeff Lowenfels and Wayne Lewis 2. "The Organic Farmer's Business Handbook: A Complete Guide to Managing Finances, Crops, and Staff - and Making a Profit" by Richard Wiswall			
Reference Books: 1. "Introduction to Permaculture" by Bill Mollison 2. "Crop Rotation on Organic Farms: A Planning Manual" by Charles L. Mohler and Sue Ellen Johnson 3. "The Organic Farming Manual: A Comprehensive Guide to Starting and Running a Certified Organic Farm" by Anne Larkin Hansen			

CO-POs/PSOs Mapping

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**2**						**2**						**2**		
CO2				**2**			**3**						**2**		
CO3			**3**		**2**									**3**	
CO4				**3**								**2**	**2**		
CO5										**3**					**3**
CO*	**2.0**		**3.0**	**2.5**	**2.0**		**2.5**			**3.0**		**2.0**	**2.0**	**3.0**	**3.0**

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT1201E	ONE HEALTH	L	T	P	C
		3	0	0	3

Course Description:

This course introduces the One Health approach and its role in addressing the interconnected health of humans, animals, plants, and the environment. It covers major global health challenges, interdisciplinary collaboration, and sustainable solutions for improving health and well-being.

Course Objectives:

1. To explain the principles and importance of the One Health approach.
2. To understand the interrelationship between human, animal, plant, and environmental health.
3. To identify major One Health challenges, including zoonotic diseases, antimicrobial resistance, climate change, and food safety.
4. To recognize the role of interdisciplinary collaboration, innovation, and technology in One Health.
5. To understand ethical and sustainable practices for promoting One Health.

Unit - I	Introduction to One Health	9 Hrs

Overview of One Health and its importance in global health; Evolution and principles of the One Health concept; Human-Animal-Plant-Environment interface; One Health, Public Health, Planetary Health and EcoHealth concepts; Multidisciplinary and transdisciplinary collaboration; Global One Health initiatives (WHO, FAO, WOAH, UNEP); One Health initiatives in India (National One Health Mission, ICMR, NCDC); Sustainable Development Goals (SDGs) and One Health.

Unit - II	Environment, Climate Change and Health	9 Hrs

Overview of environmental health and ecosystem health; Biodiversity and ecosystem services; Climate change and its impact on human and animal health; Air, water and soil pollution; Waste management and plastic pollution; Water, Sanitation and Hygiene (WASH); Food safety and food security; Environmental sustainability; Disaster risk reduction and resilience; Case studies on climate-related health events and environmental disasters.

Unit - III	Emerging Infectious Diseases and One Health	9 Hrs

Overview of zoonotic diseases and their public health importance; Ecology and drivers of emerging and re-emerging infectious diseases; Human-wildlife interface; Vector-borne and food-borne diseases; Disease surveillance and outbreak investigation; Pandemic preparedness and response; Vaccination, biosafety and biosecurity; Case studies including COVID-19, Nipah virus, Avian Influenza, Rabies, Mpox, Ebola and Kyasanur Forest Disease (KFD); One Health strategies for disease prevention and control.

Unit - IV	Antimicrobial Resistance and One Health Innovations	9 Hrs

Overview of antimicrobial resistance (AMR) and its global impact; Antibiotic use in humans, animals and agriculture; Drivers and consequences of AMR; Infection Prevention and Control (IPC); Antimicrobial stewardship; Vaccination and AMR prevention; Safe food production practices; WHO Global Action Plan on AMR; National Action Plan on AMR (India); Role of genomics, artificial intelligence, digital health, geographic information systems (GIS), remote sensing, big data and early warning systems in One Health.

Unit - V	Future Directions in One Health	9 Hrs

Emerging challenges in One Health including climate change, urbanization, biodiversity loss and food security; Planetary Health and Precision Public Health; Community participation and citizen science; One Health workforce and interdisciplinary collaboration; Innovations in One Health research and practice; Disaster preparedness and health security; Ethics, equity and social justice in One Health; Indigenous knowledge systems; Career opportunities and future research priorities in One Health.			
Total Hours			**45 Hrs**
Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
By the end of the course, students will be able to: 1. Explain the principles and significance of the One Health approach.	PO1, PO6	PSO1	**L2**
2. Describe the interrelationship between human, animal, plant, and environmental health.	PO1, PO6	PSO1	**L2**
3. Analyze major One Health challenges, including infectious diseases, antimicrobial resistance, and climate change.	PO2, PO4	PSO1	**L4**
4. Explain the role of interdisciplinary collaboration and innovation in One Health.	PO6, PO9	PSO3	**L2**
5. Demonstrate ethical and sustainable practices for promoting One Health and community well-being.	PO7, PO8	PSO3	**L3**

Text Books:

1. Atlas, R. M., & Maloy, S. (Eds.). One Health: People, Animals, and the Environment. ASM Press.
2. Zinsstag, J., Schelling, E., Waltner-Toews, D., Crump, L., & Whittaker, M. One Health: The Theory and Practice of Integrated Health Approaches. CABI.

Reference Books:

1. World Health Organization (WHO). One Health Joint Plan of Action (2022-2026).
2. World Health Organization. Global Action Plan on Antimicrobial Resistance.
3. Food and Agriculture Organization (FAO), World Organisation for Animal Health (WOAH), United Nations Environment Programme (UNEP) & WHO. One Health Joint Plan of Action.

Competency & Framework Alignment:

Framework	**Alignment**
WHO Essential Public Health Functions (EPHF)	EPHF-2: Surveillance, EPHF-3: Health Protection, EPHF-5: Disease Prevention, EPHF-6: Governance, EPHF-8: Research & Innovation
ICAPHE Competency Framework	Domain I: Public Health Foundations, Domain III: Epidemiology, Domain IV: Environmental & Planetary Health, Domain VI: Leadership
SDG Mapping	SDG 2, 3, 6, 12, 13, 15 & 17

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2					2							2		
CO2	2					2							2		
CO3		3		2									3		
CO4						2			2						2
CO5							3	2							3
CO*	2.0	3.0		2.0		2.0	3.0	2.0	2.0				2.3		2.5

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT1201F	BASICS OF PHYSIOTHERAPY	L	T	P	C
		3	0	0	3

Course Description:

The course is designed to aim at imparting a basic level health program. This program is formulated to enable student to gain adequate knowledge, skills and leading to an ability to identify the basics of early features of the health issues

Course Objectives:

The objective of this course is to make students to:

1. Gather and interpret information within a holistic framework pertaining to health.
2. The overall content of the curriculum focuses on health care and clinical education experiences for each student
3. Understand the basic fundamentals of physiotherapy
4. Familiarizes participants with different procedures and techniques used in physiotherapy and their practical application across various conditions
5. Provide participants with a substantial understanding of physiotherapy and promote safe practices and ethical behaviour in physiotherapy practice.

Unit - I	Basics of Physiotherapy	5 Hrs
What is Physiotherapy? Types of Physiotherapy; Benefits of Physiotherapy; Why is Physiotherapy done?		
Unit - II	**Women's Health**	**5 Hrs**
Pre natal exercises & Care; Post Natal exercises		
Unit - III	**Acute injuries & management and the uses of Orthotics & Prosthetics**	**10 Hrs**
Mechanism of injury; Acute muscle injuries - Muscle strain, Risks of muscle strain, Muscle imbalance, Muscle inflexibility; Ligament sprain and difference between sprain and strain; Orthotics & Prosthetics		
Unit - IV	**Ergonomics & Health and Aerobics**	**13 Hrs**
Work-related musculoskeletal disorders (MSDs); Risk factors associated with work-related MSDs & Possible Causes; Common ergonomic symptoms; Different types of Ergonomics & principles of ergonomics and Ergonomic Control Methods; Awkward body postures - hazards; Physical Activity and exercise; Physical Fitness and Maximum Oxygen Consumption; Aerobic Exercise Training and Physiological Response to Aerobic Exercise; Cardiovascular Response to Exercise and Respiratory Response to Exercise; Responses Providing Additional Oxygen to Muscle and Exercise Program; Warm-Up Period, Aerobic Exercise Period and Cool-Down Period Application		
Unit - V	**Education & Awareness about common diseases and BLS**	**12 Hrs**
Bell's palsy; Diabetes; Coronary artery heart disease; OA Knee; Stroke; LBA; Early identification of congenital anomalies; BLS Theory; BLS Practical's		
Total Hours		**45 Hrs**

Course Outcomes:	POs	PSOs	Peak BTL
1. Gain the basic knowledge of Physiotherapy	PO1	PSO1	**L1**
2. Familiarize the procedures and techniques used in physiotherapy	PO1, PO5	PSO1, PSO2	**L2**
3. Protect and manage from the sport injuries	PO1, PO3	PSO1	**L3**
4. Gain Knowledge about Ergonomics	PO1, PO6	PSO1	**L2**
5. To maintain physical fitness	PO12	PSO3	**L3**

Text Books:

1. Physiotherapy In Obstetrics And Gynecology-Polden And Mantle, Jaypee Brothers
2. Women's Health- Ruth Sapsford, Lippincott, 1998
3. Textbook of orthopedics medicine Vol I & II by James Cyriax - Bailliere
4. Susan B O'Sullivan, Physical Rehabilitation 6th Edition, 6 edition F A Davis; 2013. ISBN-13: 978-0803625792
5. Arias" Practical Guide To High Risk Pregnancy And Delivery By Amarnath Bhide, Sabaratnam Arulkumaran

Reference Books:

1. John Ebenezer- Essentials of Orthopedics for Physiotherapists- 3rd edition 2016
2. Davidson's principles and practice of medicine
3. Fundamentals of Ergonomics in Theory and Practice- Alan Hedge- 2019
4. Introduction to Ergonomics, Third Edition -Robert Bridger- 2018
5. Human Factors and Ergonomics in Practice: Improving System Performance and Human Well-Being- Steven Shorrock, Claire Williams- 2020
6. Acute Care Handbook for Physical Therapists- Jaime C. Paz, Michele P. West- 2019
7. Sports Injury Prevention and Rehabilitation: Integrating Medicine and Science for Performance Solutions- David Joyce, Daniel Lewindon- 2015
8. Orthotic Intervention for the Hand and Upper Extremity: Splinting Principles and Process- Marylyn A. Jacobs, Noelle M. Austin- 2013
9. Prosthetics and Orthotics: Lower Limb and Spine- Joan E. Edelstein, Alex Moroz- 2017
10. "Essentials of Physiotherapy"- Prakash Narain Tandon- 2016
11. Pathology for the Physical Therapist Assistant - Catherine C. Goodman, Kenda S. Fuller- 2020 (3rd Edition)

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2												2		
CO2	2				2								2	2	
CO3	2		2										2		
CO4	2					2							2		
CO5												2			2
CO*	2.0		2.0		2.0	2.0						2.0	2.0	2.0	2.0

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT1201G	PERSONALITY DEVELOPMENT	L	T	P	C
		3	0	0	3

Course Description:

Personality Development is a comprehensive course designed to equip undergraduates with the essential skills and knowledge required for personal growth and professional success. The course focuses on enhancing self-awareness, emotional intelligence, communication, and interpersonal skills. Students will learn how to build confidence, manage stress, and develop effective time management strategies. Additionally, the course covers critical aspects of professional development, including resume writing, interview techniques, and personal branding.

Course Objectives:

1. To develop self-awareness and emotional intelligence.
2. To enhance communication and interpersonal skills.
3. To build confidence and self-esteem.
4. To foster professional and personal growth.
5. To prepare students for successful careers and meaningful personal lives.

Unit - I	Introduction to Personality Development	9 Hrs

Definition and importance of personality development; Initial self-assessment and goal setting; Short-term and long-term goal setting; Understanding oneself: strengths, weaknesses, opportunities, threats (SWOT analysis); Values, beliefs, and attitudes; Personal vision and mission statements; Components of emotional intelligence (EQ); Self-regulation and self-motivation; Empathy and social skills.

Unit - II	Communication Skills and Interpersonal Skills	9 Hrs

Communication Skills; Verbal and non-verbal communication; Active listening and feedback; Public speaking and presentation skills; Building and maintaining relationships; Conflict resolution and negotiation; Teamwork and collaboration; Importance of cultural sensitivity in a globalized world; Developing intercultural communication skills

Unit - III	Critical Thinking, Problem Solving and Self-Esteem	9 Hrs

Enhancing analytical and critical thinking skills; Creative problem-solving techniques Decision-making process; Confidence and Self-Esteem; Building self-confidence; Overcoming self-doubt and negative thinking; Techniques for boosting self-esteem.

Unit - IV	Time Management and Stress Management	7 Hrs

Prioritization and productivity techniques; Overcoming procrastination; Identifying sources of stress; Techniques for managing and reducing stress; Work-life balance.

Unit - V	Professional Development and Leadership Skills	11 Hrs

Resume writing and job interview skills; Professional etiquette and workplace behavior Networking skills; Traits of effective leaders; Leadership styles and theories; Developing leadership qualities; Personal Branding, Building a personal brand; Online presence and social media etiquette; Personal branding strategies; Final self-assessment and reflection on personal growth

Total Hours			**45 Hrs**
Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
By the end of this course, students will be able to: 1. Develop a personal vision and mission statement to guide future actions and decisions.	PO12	PSO3	**L3**
2. Exhibit improved verbal and non-verbal communication skills.	PO10	PSO3	**L3**
3. Apply strategies to boost self-confidence and maintain high self-esteem.	PO9	PSO3	**L3**
4. Implement effective time management techniques to enhance productivity.	PO9, PO12	PSO3	**L3**
5. Develop and demonstrate leadership qualities in various scenarios.	PO9, PO10	PSO3	**L3**
Text Books: 1. Student's Hand Book- Skill Genie-Higher Education Department, Govt. Of Andhra Pradesh - https://svimstpt.ap.nic.in/edu/skill_genie.pdf. 2. The only skill that matters- Jonathan.Levi (2019)- Super Human Enterprises, LLC. All rights reserved. ISBN:978-1-5445-0435-3			
Reference Books: 1. Online courses and TED Talks on personality development and self-improvement. 2. "How to Win Friends and Influence People" by Dale Carnegie (1936) Revised- 2022.			

CO-POs/PSOs Mapping

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1												**2**			**2**
CO2										**3**					**3**
CO3									**2**						**2**
CO4									**2**			**2**			**2**
CO5									**3**	**2**					**3**
CO*									**2.3**	**2.5**		**2.0**			**2.4**

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT1201H	NURSING	L	T	P	C
		3	0	0	3

Course Description:

This module is designed to help the students to acquire comprehensive knowledge in basic concepts of Health, Nursing, Vital signs, Basic Life support, home care management of Diabetes & Hypertension and Adolescent health.

Course Objectives:

Students undergoing this course are expected to:

1. Understand the concept of health, illness, and Nursing
2. Learn the technique of assessing and monitoring vital signs
3. Perform BLS using evidence based national or international guidelines in the management of adult victims with the cardiac arrest.
4. Understand the concept of home care management of Diabetes and Hypertensive persons
5. Develop understanding about the normal growth and development, needs and health issues of adolescents

Unit - I	Concepts of Health and Nursing	03 Hrs

Definition of Health and illness, Health-illness continuum, Factors influencing Health, Nursing as a profession and Career ladder.

Unit - II	Vital signs	12 Hrs

Temperature: Physiology, regulation, factors affecting body temperature, Assessment of body temperature: sites, technique and special considerations. Pulse: Physiology & regulation, characteristics of the pulse, factors affecting pulse, Assessment of the pulse: sites, location, technique and special considerations. Respiration: Physiology and regulation, mechanics of breathing, characteristics of the respiration, factors affecting respiration, Assessment of respiration: technique and special considerations. Blood pressure: Physiology and regulation, characteristics of the blood pressure, factors affecting blood pressure. Assessment of blood pressure: sites, equipment and technique and special considerations. Recording of vital signs. Pain: Definition, types physiology of pain and factors influencing the pain

Unit - III	Basic life support / basic cardiopulmonary life support (BLS/BCLS)	8 Hrs

Introduction, definition, purposes, indications, contraindications and steps in procedure.

Unit - IV	Home care management of Diabetes and Hypertension	12 Hrs

Diabetes- Introduction to Diabetes Mellitus - A National and Global burden: Classification, risk factors, pathophysiology, manifestations, screening, diagnostic criteria and complications, The treatment Modalities of Diabetes Mellitus: (Life style modifications, Diet therapy, Exercise, Medical Management, Self-Management, Practical Aspects: Blood Glucose monitoring, Diabetic foot care, Exercises, Diabetic Diet Planning, Self-Insulin administration). Hypertension- Introduction to Hypertension, Types, risk factors, pathophysiology, manifestations, diagnostic criteria and complications, treatment modalities: life style modifications, Diet therapy, Exercise, Medical management.

Unit - V	Adolescent Health	10 Hrs
Growth and Development of adolescent, Nutritional and developmental needs of adolescent, Common health problems including mental health problems, Reproductive and sexual health issues		
Total Hours		**45 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
At the end of this course, students should be able to: 1. Acquire a thorough knowledge on concept of health and illness.	PO1	PSO1	**L1**
2. Demonstrate skills in monitoring the vital signs	PO1, PO5	PSO1, PSO2	**L3**
3. Develop skills in performing BLS/BCLS	PO1, PO3	PSO1, PSO2	**L3**
4. Able to attain knowledge and skills on treatment modalities of DM	PO1, PO3	PSO1	**L3**
5. Aware of normal Growth and development and common health problems in adolescent	PO1, PO6	PSO1	**L2**

Text Books:

1. Potter and perrys, Fundamentals of Nursing, 4th edition, Mosby, Elsevier publication
2. Lewis, textbook of Medical Surgical Nursing 4th south Asian edition, Elsevier publication
3. Dorothy R. Marlow, Text book of paediatric nursing, sixth edition, Elsevier publications,

Reference Books:

1. Joyce M black textbook of medical surgical nursing, 8th edition, Elsevier publications,
2. Kozier and Erbs, textbook of fundamentals of Nursing, Elsevier publications.

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**2**												**2**		
CO2	**2**				**2**								**2**	**2**	
CO3	**2**		**2**										**2**	**2**	
CO4	**3**		**2**										**3**		
CO5	**2**					**2**							**2**		
CO*	**2.2**		**2.0**		**2.0**	**2.0**							**2.2**	**2.0**	

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT1201I	ENTREPRENEURSHIP	L	T	P	C
		3	0	0	3

Course Description:

This course provides an in-depth understanding of entrepreneurship, its applications, and its scope. Students will learn to generate broad ideas for starting an enterprise or startup and convert them into viable opportunities. The course covers the essentials of managing startups, understanding small and medium enterprises, and gaining knowledge of various financial institutions.

Course Objectives:

1. Understand the concept of Entrepreneurship, its applications and scope.
2. Application of knowledge for generating a broad idea for a starting an enterprise/start up and converting to opportunity.
3. Knowledge of managing the start-up's
4. Understand the small and medium enterprises
5. Knowledge of different financial institutions

Unit - I		**9 Hrs**
Entrepreneurship: Definition and Concept of entrepreneurship - Entrepreneur Characteristics - Classification of Entrepreneurs - Role of Entrepreneurship in Economic Development		
Unit - II		**9 Hrs**
Idea to Opportunity- Introduction, Sources of New Ideas, Techniques for Generating Ideas, Assessing Business Potential of an Idea, Opportunity Recognition, Sources and process, Indian Economy- Opportunities, Steps Involved in Tapping Opportunity		
Unit - III		**9 Hrs**
Entrepreneurship Development - Intrapreneurship, Entrepreneurship as a Career Option, Female Entrepreneurship and problems, Types of Start-ups, Start-ups and mistakes, Managing Start-ups During Downturn		
Unit - IV		**9 Hrs**
Entrepreneurship Trends- Small and Medium Business Enterprises, International Entrepreneurship, Entrepreneurship-Emerging Trends in the Global Knowledge Economy		
Unit - V		**9 Hrs**
Institutions Supporting and Taxation Benefits: Central level Institutions: NABARD; SIDBI,- State Level Institutions -DICs - SFC - Government Policy for MSMEs - Tax Incentives and Concessions.		
Total Hours		**45 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Basic understanding of entrepreneurship	PO1	PSO1	**L1**

2. Knowledge of idea generation and opportunities identification of entrepreneurship	PO3, PO12	PSO1	**L2**
3. Understand different forms of enterprises	PO1, PO11	PSO1	**L2**
4. Understand different emerging trends of entrepreneurship	PO11, PO12	PSO1	**L2**
5. Knowledge of different financial institutions	PO11	PSO1	**L1**

Text Books:

1. Arya Kumar, Entrepreneurship, Pearson, Delhi
2. Poornima MCH, Entrepreneurship Development - Small Business Enterprises, Pearson, Delhi

Reference Books:

1. Anil Kumar, S., ET.al., Entrepreneurship Development, New Age International Publishers, New Delhi
2. Khanka, SS, Entrepreneurship Development, S. Chand, New Delhi
3. Peter F. Drucker, Innovation and Entrepreneurship
4. A.Sahay, M. S. Chhikara, New Vistas of Entrepreneurship: Challenges & Opportunities

CO-POs/PSOs Mapping

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**2**												**2**		
CO2			**2**									**2**	**2**		
CO3	**2**										**2**		**2**		
CO4											**2**	**2**	**2**		
CO5											**2**		**2**		
CO*	**2.0**		**2.0**								**2.0**	**2.0**	**2.0**		

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT1201J	MANAGERIAL ECONOMICS	L	T	P	C
		3	0	0	3

Course Description:

This course provides a solid foundation in the fundamentals of economics and managerial economics. Students will learn to apply concepts of production cost and revenues for effective business decisions. The course also covers analyzing capital investments to maximize returns, understanding different forms of business organizations, and evaluating business organizations and marketing strategies.

Course Objectives:

1. Understand the fundamentals of Economics and Managerial economics.
2. Apply the Concept of Production cost and revenues for effective Business decision.
3. Analyze how to invest their capital and maximize returns.
4. Understand different forms of business organizations.
5. Evaluate Business organizations and marketing strategies

Unit - I	Introduction	9 Hrs

Meaning, Nature, Significance, Functions, and Advantages, ME and its role in other fields. Demand - Concept, Function, Law of Demand - Demand Elasticity- Types - Measurement. Demand Forecasting- Factors governing forecasting and methods.

Unit - II	Production	9 Hrs

Introduction - Nature, meaning, significance, functions and advantages. Production Function- Least- cost combination- Short run and Long run Production Function- Isoquants and Isocosts, MRTS - Cobb-Douglas Production Function - Laws of Returns

Unit - III	Cost & Break-Even Analysis	9 Hrs

Cost concepts and Cost behavior- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems)-Managerial significance and limitations of Break-Even Analysis.

Unit - IV	Business Organizations	9 Hrs

Introduction - Nature, meaning, significance, functions and advantages. Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises.

Unit - V	Markets	9 Hrs

Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition-Oligopoly-Price-Output Determination - Pricing Methods and Strategies.

Total Hours	45 Hrs

Course Outcomes:	POs	PSOs	Peak BTL
1. Basic understanding of managerial economics	PO1	PSO1	L1
2. Develop an understanding of the applications of production	PO2, PO11	PSO1	L2

3. Interpret cost analysis	PO2, PO11	PSO1, PSO2	**L3**
4. Understand different forms of business organizations.	PO11	PSO1	**L2**
5. Analyse the causes and consequences of different market conditions.	PO2, PO11	PSO1	**L4**

Text Books:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019.

Reference Books:

1. Ahuja Hl Managerial economics Schand, 3/e, 2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**2**												**2**		
CO2		**2**									**2**		**2**		
CO3		**2**									**2**		**2**	**2**	
CO4											**2**		**2**		
CO5		**3**									**2**		**2**		
CO*	**2.0**	**2.3**									**2.0**		**2.0**	**2.0**	

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT1201K	LEADERSHIP DEVELOPMENT	L	T	P	C
		3	0	0	3

Course Description:

This course provides a comprehensive introduction to the fundamental concepts of leadership. Students will gain knowledge of different leadership levels and styles, and understand the significance of vision and strategy formulation.

Course Objectives:

1. Understand the basic concepts of leadership
2. Knowledge of leadership development strategy
3. Knowledge of leadership development approaches
4. Knowledge of leadership traits
5. Awareness on self-awareness exercises.

Unit - I	Understanding Leadership	9 Hrs
Defining Leadership; Leadership styles, Entrepreneurial leaders, Different levels of leaders		
Unit - II	**Strategy formulation**	**9 Hrs**
Formulation of vision, Strategy formulation and communication, role of the leader in managing change, foundation for effective team development		
Unit - III	**Leadership development approaches**	**9 Hrs**
Significance of leadership development strategy, leadership development approaches- One-to-one coaching, Mentor schemes, Role of HR and development, Buddy pairs, Action learning sets, Work-based projects		
Unit - IV	**Recognizing Leadership Traits**	**9 Hrs**
Historical Leaders; Traits Leaders Display, Leadership Studies: What Traits Do Effective Leaders Exhibit.		
Unit - V	**Recognising self**	**9 Hrs**
Exercises of Self-awareness using Johari Window, Development diaries, Feedback exercises, Personal vision setting		
Total Hours		**45 Hrs**

Course Outcomes:	POs	PSOs	Peak BTL
1. Understand the basic concepts of leadership	PO9, PO10	PSO3	L2
2. Understand the significance of vision and strategy formulation	PO9, PO11	PSO3	L2
3. Knowledge of leadership development approaches.	PO9, PO12	PSO3	L2
4. Knowledge of leadership traits.	PO9	PSO3	L1

5. Knowledge of self-awareness techniques	PO9, PO12	PSO3	**L2**

Text Books:

1. Rosemary Ryan, Leadership Development - A guide for HR and Training professionals, ELSEVIER, UK

2. Kim S. Cameron, Positive Leadership: Strategies for Extraordinary Performance

Reference Books:

1. Manuel London, Leadership Development: Paths To Self-insight and Professional Growth, Psychology Press, New York.

2. Susan E. Murphy, Ronald E. Riggio, The Future of Leadership Development, Routledge is an imprint of Taylor & Francis

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1									**2**	**2**					**2**
CO2									**2**		**2**				**2**
CO3									**3**			**2**			**2**
CO4									**2**						**2**
CO5									**2**			**2**			**2**
CO*									**2.2**	**2.0**	**2.0**	**2.0**			**2.0**

Level: 3 - High, 2 - Moderate, 1 – Low

26TAUT1201L	SOCIAL ENTREPRENEURSHIP	L	T	P	C
		3	0	0	3

Course Description:

This course explores the role of social entrepreneurship in societies, economies, and politics. Students will learn about the three pillars of social entrepreneurship and the different types of partners and their advantages. The course also covers the typical process steps of creating a marketing concept and describes the characteristics of the financing structure of social enterprises.

Course Objectives:

1. Understand the role of social entrepreneurship in societies, economies and politics
2. Explain the three pillars of social entrepreneurship.
3. Describe different types of partners for social entrepreneurs and their particular advantages.
4. Understand the typical process steps of a marketing conception.
5. Describe the characteristics of the financing structure of social enterprises.

Unit - I	Introduction	9 Hrs

Meaning of social entrepreneurship- concepts and typologies, its disparity with social business and CSR, social entrepreneur & personality, social enterprise.

Unit - II	Drivers and scope	9 Hrs

Role of Social Entrepreneurship in -Societies, Economies and Politics, The Drivers of Social Entrepreneurship, Size and Scope of Social Entrepreneurship, Opportunities for Social Entrepreneurs.

Unit - III	Collaboration and Partnerships	9 Hrs

Reasons for Crafting Collaborations, Specific Types of Collaborations, Different Collaboration Partners, Potential Risks and Challenges, Guidelines to Establish a Collaboration.

Unit - IV	Elements of a Marketing Conception	9 Hrs

Market analysis, Marketing Goals, Competitive Strategy, Measures, Controlling; Peculiarities Concerning Marketing for Social Enterprises, Marketing Importance for Social Enterprises.

Unit - V	Finance	9 Hrs

Types of Financing Instruments- Donations, Equity capital, Debt capital, Hybrid capital; Financing institutions-value banks, social investment advisors, social stock exchange, Venture Philanthropy Funds, Social Investment Funds, Funding Consultancies

Total Hours	45 Hrs

Course Outcomes:	POs	PSOs	Peak BTL
1. Knowledge of social entrepreneurship differentiation from other related concepts	PO1, PO6	PSO1	L2
2. Understand the role of social entrepreneurship in societies, economies and politics	PO6, PO7	PSO3	L2

3. Analysis of different types of partners for social entrepreneurs.	PO2, PO9	PSO1	**L4**
4. Understand the typical process steps of a marketing conception.	PO3, PO11	PSO1, PSO2	**L2**
5. Awareness of the peculiarities of financial elements in social enterprises	PO11	PSO1	**L2**

Text Books:

1. Christine K. Volkmann & Kim Oliver Tokarski. 2012. Social Entrepreneurship and Social Business. Springer Gabler

2. Madhukar Shukla: Social Entrepreneurship in India. Sage publications

Reference Books:

1. Archana Singh (auth.) The Process of Social Value Creation: A Multiple-Case Study on Social Entrepreneurship in India. Springer India. 2016.

2. Ryszard Praszkier; Andrzej Nowak. Social entrepreneurship: theory and practice [1 ed.]. Cambridge University Press

3. Alex Nicholls. Social Entrepreneurship: New Models of Sustainable Social Change. Oxford University Press, USA

CO-POs/PSOs Mapping

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**2**					**2**							**2**		
CO2						**2**	**2**								**2**
CO3		**2**							**2**				**2**		
CO4			**2**								**2**		**2**	**2**	
CO5											**3**		**2**		
CO*	**2.0**	**2.0**	**2.0**			**2.0**	**2.0**		**2.0**		**2.5**		**2.0**	**2.0**	**2.0**

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT1201M	GENDER AND DEVELOPMENT	L	T	P	C
		3	0	0	3

Course Description:

This course introduces students to the fundamental concepts, theories and contemporary issues related to gender. It enables students to understand gender as a social and cultural construct and examine how gender roles, norms, stereotypes and power relations influence individuals, families, institutions and society. The course introduces major feminist theories and women's, transgender, intersex and LGBTQIA+ movements, with particular emphasis on the development of feminist thought and women's movements in India. The course further examines major gender issues, including gender-based violence, discrimination, poverty, health inequalities, workplace concerns and the challenges faced by sexual and gender minorities. It introduces students to legal safeguards, institutional mechanisms, support services and initiatives addressing gender inequality and violence. The course also critically examines the role of mainstream, feminist, alternative and digital media in representing and constructing gender, masculinity, femininity and sexuality. The course aims to develop gender sensitivity, critical thinking and an understanding of gender justice among students.

Course Objectives:

The course aims to:

1. Introduce students to the fundamental concepts and terminology related to gender, sexuality, gender identity, gender diversity and gender relations.
2. Develop an understanding of major feminist theories, the evolution of feminist thought and important women's, LGBTQIA+, intersex and transgender movements.
3. Examine major contemporary gender issues and understand their social, economic, cultural and psychological causes and consequences.
4. Create awareness about constitutional safeguards, laws, institutional mechanisms and support services available to address gender inequality, discrimination and gender-based violence.
5. Develop the ability to critically examine the role of mainstream, feminist, alternative and digital media in constructing and representing gender, masculinity, femininity and sexuality.

Unit - I	Basic Concepts of Gender	9 Hrs

Concepts: Women's Studies; Gender Studies; Gender; Sex; Intersex; Cisgender; Transgender; Gender Identity; Gender Expression; Gender Roles; Gender Socialisation; Gender Stereotypes; Gender Norms; Gender Division of Labour; Masculinity and Femininity; Gender Discrimination; Gender Inequality; Gender Equality; Gender Equity; Gender Neutrality; Gender Mainstreaming; Gender Bias; Gender-Blind; Patriarchy; Sexism; Misogyny; Male Chauvinism; Glass Ceiling; Intersectionality; Sexuality; LGBTQIA+ Identities.

Unit - II	Feminism, Feminist Theories and Women's Movements	9 Hrs

Introduction to Feminism. Overview of Feminist Theories: Liberal Feminism; Radical Feminism; Black Feminism; Dalit feminism; Cyberfeminism. Women's Movements in India: Chipko Movement; Anti-Arrack Movement; Telangana Movement; Contemporary Women's Movements; #MeToo Movement in India. Contemporary Gender Movements: Intersex Rights Movements; Transgender Rights Movements; LGBTQIA+ Movements.

Unit - III	Contemporary Gender Issues	9 Hrs
Gender-Based Violence: Domestic Violence; Dowry; Rape and Sexual Violence; Sexual Harassment and Sexual Assault; Eve Teasing, Acid Attacks; Honour-Based Violence (Killings). Human Trafficking of Women and Children; Prostitution, Child Marriage; Female Infanticide; Female Foeticide; Female Genital Mutilation. Problems of Working Women; LGBTQIA+ Issues; Gender-Based Health Inequalities.		
Unit - IV	**Gender Justice, Laws, Institutional Mechanisms and Support Services**	**9 Hrs**
Legal Protection for Women and Transgender Persons. Institutional Mechanisms: National Commission for Women; State Women's Commissions; Crime Against Women Cells; Family Courts; Family Counselling Centres; Crisis Intervention Centres; One-Stop Centres. Women's Empowerment Schemes: Beti Bachao Beti Padhao; Sakhi Niwas; Mahila Shakti Kendras; Mahila Police Volunteers; Pink Police; Nari Shakti Puraskar; Swadhar Greh; Nirbhaya Schemes.		
Unit - V	**Gender and Media**	**9 Hrs**
Gender and Media: Types of Media - Mainstream, Feminist and Alternative Media; Functions of Media; Media as an Agent of Socialisation. Gender Representation in Media: Representation of Women and Sexual and Gender Minorities; Gender Stereotypes; Objectification; Sexualisation; Underrepresentation and Misrepresentation. Construction of Gender in Media: Representation of Masculinity and Femininity; Gender Roles and Beauty Standards; Impact of Media on Gender Attitudes, Behaviour and Lifestyle. Digital Media and Gender: Cyberbullying; Cyberstalking; Online Sexual Harassment; Privacy Violations; Image-Based Abuse; Cybercrimes and Legal Protection. Indecent Representation of Women; Pornography; Media Ethics.		
Total Hours		**45 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
By the end of the course, students will be able to: 1. Explain the basic concepts of gender, sex, sexuality, gender identity, gender roles, gender norms, gender diversity and intersectionality.	PO6, PO8	PSO3	**L2**
2. Describe and compare major feminist theories and critically understand the development and significance of women's, LGBTQIA+, intersex and transgender movements.	PO6, PO9	PSO3	**L4**
3. Identify and analyse major contemporary gender issues, including gender-based violence, discrimination, poverty, health inequalities, workplace concerns and the marginalisation of sexual and gender minorities.	PO6, PO7	PSO1, PSO3	**L4**
4. Recognise and explain the role of constitutional safeguards, laws, institutional mechanisms, support services and social interventions in addressing gender inequality and promoting gender justice.	PO6, PO8	PSO3	**L2**

5. Critically examine the representation and construction of gender, masculinity, femininity and sexuality in mainstream, feminist, alternative and digital media, and demonstrate sensitivity towards gender equality and diversity.	PO8, PO10	PSO3	**L5**

Text Books:

1. Oakley, Ann. Sex, gender and society. Routledge, 2016
2. Kamla Bhasin. 2003. Understanding Gender, New Delhi: Women Unlimited.
3. Radha Kumar. 2015. The History of Doing: An Illustrated Account of Movements for Women's Rights and Feminism in India, 1800 - 1990. New Delhi: Zubaan.
4. Revathi, A. The Truth About Me: A Hijra Life Story. Penguin Books, 2010.
5. Reed, Evelyn, 1985, Is biology Women's Destiny?. Pathfinder Press

Supplementary Readings:

1. Hooks, Bell. (2000). Feminism is for everybody: Passionate politics. Pluto Press.
2. Tharu, Susie, A. Suneetha, and Uma Maheswari Bhrugubanda, editors. A World of Equals: A Textbook on Gender. Orient BlackSwan, 2022
3. Media, gender, and popular culture in India: Tracking change and continuity. SAGE Publishing India, 2011.
4. Butler, Judith, 1990, Gender Trouble, Routledge, New York

Web Links (Online Source):

1. https://www.studocu.com/row/document/kohat-university-of-science-and-technology/gender-studies/gender-studies-new-lecture-notes-1-7/5176872
2. https://teentalk.ca/learn-about/gender-identity/
3. https://genderspectrum.org/articles/understanding-gender
4. https://eige.europa.eu/gender-mainstreaming/concepts-and-definitions

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						**2**		**2**							**2**
CO2						**2**			**2**						**2**
CO3						**3**	**2**						**2**		**2**
CO4						**2**		**3**							**3**
CO5								**2**		**2**					**3**
CO*						**2.3**	**2.0**	**2.3**	**2.0**	**2.0**			**2.0**		**2.4**

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT1201N	CONSTITUTION OF INDIA	L	T	P	C
		3	0	0	3

Course Description:

The Constitution of India course provides a comprehensive understanding of the fundamental principles, structure, and functioning of the Indian Constitution. This course examines the historical evolution, key features, and various interpretations of the Constitution, highlighting its significance in shaping India's legal and political landscape. Through this course, students will gain insights into the roles and responsibilities of different branches of government, fundamental rights and duties of citizens, and the constitutional mechanisms that ensure the democratic functioning of the nation.

Course Objectives:

1. To realize the significance of constitution of India to students from all walks of life and help them to understand the basic concepts of Indian constitution.
2. To identify the importance of fundamental rights as well as fundamental duties.
3. To understand the functioning of Union, State and Local Governments in Indian federal system.
4. To learn procedure and effects of emergency, composition and activities of election commission and amendment procedure.
5. To acquire knowledge to appear for competitive examinations.

Unit - I		**9 Hrs**
Historical Background - Constituent Assembly of India - Philosophical Foundations of The Indian Constitution - Preamble - Constitutional amendments		
Unit - II		**9 Hrs**
Fundamental Rights - Directive Principles of State Policy - Fundamental Duties - Citizenship - Constitutional Remedies for Citizens;		
Unit - III		**9 Hrs**
Union Government - Structures of the Union Government and Functions - President - Vice President - Prime Minister - Cabinet - Parliament - Supreme Court of India - Judicial Review.		
Unit - IV		**9 Hrs**
State Government - Structure and Functions - Governor - Chief Minister - Cabinet - State Legislature - Judicial System in States - High Courts and other Subordinate Courts.		
Unit - V		**9 Hrs**
Statutory Institutions -Elections-Election Commission of India, National Human Rights Commission, National Commission for Women; Local Self Government; Lok pal.		
Total Hours		**45 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
At the end of the course the student should be able to:			

1. Understand and explain the significance of Indian Constitution as the fundamental law of the land.	PO6, PO8	PSO3	**L2**
2. Exercise his fundamental rights in proper sense at the same time identifies his responsibilities in national building.	PO6, PO9	PSO3	**L3**
3. Analyze the Indian political system, the powers and functions of the Union, State and Local Governments in detail	PO2, PO6	PSO1	**L4**
4. Understand Electoral Process, Emergency provisions and Amendment procedure.	PO6, PO12	PSO1	**L2**
5. Take part in competitive examinations with confidence.	PO10, PO12	PSO3	**L3**

Text Books:

1. Durga Das Basu, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi.
2. R.C.Agarwal, (1997) "Indian Political System", S.Chand and Company, New Delhi.

Reference Books:

1. Sharma, Brij Kishore, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi.
2. The Constitution of India (2022): https://cdnbbsr.s3waas.gov.in/s380537a945c7aaa788ccfcdf1b99b5d8f/uploads/2023/05/2023050195.pdf
3. Refer the website through the link given for Constitution of India in various Indian Languages https://legislative.gov.in/constitution-of-india/
4. Indian Constitution at Work by National Council of Educational Research and Training, Sri Aurobindo Marg, New Delhi

CO-POs/PSOs Mapping

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1						**2**		**2**							**2**
CO2						**2**			**2**						**2**
CO3		**2**				**3**							**2**		
CO4						**2**						**2**	**2**		
CO5										**2**		**2**			**2**
CO*		**2.0**				**2.3**		**2.0**	**2.0**	**2.0**		**2.0**	**2.0**		**2.0**

Level: 3 - High, 2 - Moderate, 1 – Low

26TAUT1201O	MATHEMATICAL THINKING	L	T	P	C
		3	0	0	3

Prerequisite: Nil.

Course Description:

Mathematical Thinking is a university elective course that teaches fundamental concepts of basic algebraic and mathematical operations. After learning this course, students will be able to develop stronger problem-solving skills and apply this course for continued practice. The course emphasizes problem-solving skills and analytical thinking, and equips students with the skills necessary to tackle real-world problems using basic mathematical and arithmetical concepts.

Course Objectives:

1. To familiarize students with the fundamental concepts of basic numbers, mathematical operations, and divisibility rules.
2. To summarize the basic concepts of mathematical operations on numbers and calculate LCM and GCD to solve simple problems.
3. To apply BODMAS and algebraic identities to simplify mathematical expressions.
4. To understand and evaluate the square root and cube root of different types of numbers.
5. To impart the arrangements and selections of things, counting numbers, and basic probability concepts.

Unit - I	Number System and Tests of Divisibility	9 Hrs

Digits, Numbers, Indian-Hindu-Arabic System, Roman Numbers, Face Value and Place Values, Various Types of Numbers or Standard Numbers, Prime Numbers, Composite Numbers, Perfect Numbers, Co-primes (or Relative Primes), Twin Primes, Testing of Prime Numbers, Mathematical Operations on Even and Odd Numbers.

Unit - II	LCM and GCD (or HCF)	9 Hrs

Factors and Multiples, Highest Common Factor (HCF) or Greatest Common Measure (GCM) or Greatest Common Divisor (GCD) – Factorization Method, Division Method, Finding the HCF of More Than Two Numbers, Factorization Method of Finding LCM, HCF and LCM of Fractions.

Unit - III	Simplifications	9 Hrs

BODMAS Rule, Modulus of a Real Number, Vinculum (or Bar), Algebraic Identities, Set Theory Operations (Union, Intersection, Complements).

Unit - IV	Square Roots, Cube Roots, Averages and Percentages	9 Hrs

Square Root, Cube Root, Problems on Numbers, Concept of Averages, Problems on Averages, Concept of Percentage and Problems on Percentages.

Unit - V	Permutations, Combinations and Probability	9 Hrs

Fundamental Principle with Respect to Addition and Multiplication, Permutations, Combinations, Relation between Permutation and Combination, Random Experiment, Sample Space and Basic Problems of Events of Probability.

Total Hours	45 Hrs

Course Outcomes:	POs	PSOs	Peak BTL
1. Explain fundamental concepts of the basic number system, including standard numbers, mathematical operations, and divisibility rules.	PO1, PO12	1	2
2. Apply mathematical operations on numbers and calculate LCM and GCD to solve simple problems.	PO1, PO2	1	3

3. Apply BODMAS rules and algebraic identities to simplify mathematical expressions.	PO1, PO2	**1**	**3**
4. Evaluate the square root and cube root of different types of numbers and calculate appropriate solutions to problems on averages and percentages.	PO1, PO2	**1**	**3**
5. Apply the principles of permutations, combinations and probability to solve simple counting and probability problems.	PO1, PO2	**1**	**3**

Text Books:

1. R.S. Aggarwal, Quantitative Aptitude, S. Chand Publishing.
2. S. Chandu, Quantitative Aptitude, S. Chand Publishing.
3. Andhra Pradesh Academy of IPE, Quantitative Aptitude Text Book.

Reference Books:

1. Quicker Mathematics, Quantitative Aptitude, 2/e.
2. Abhijit Guha, Quantitative Aptitude, 4/e.
3. GSR Publications, Quantitative Aptitude, Guntur, 3/e.

Web Links (Online Source):

1. https://www.khanacademy.org/math/arithmetic
2. https://www.geeksforgeeks.org/quantitative-aptitude/

CO-POs/PSOs Mapping

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**											**1**	**1**		
CO2	**3**	**1**											**1**		
CO3	**2**	**2**											**1**		
CO4	**2**	**1**											**1**		
CO5	**2**	**2**											**1**		
CO*	**2.4**	**1.5**										**1.0**	**1.0**		

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT1201P	INTRODUCTION TO COMPUTING AND DIGITAL LITERACY	L	T	P	C
		3	0	0	3

Course Description:

This course introduces students to the fundamentals of computing and digital technologies required in academic, professional, and everyday environments. It covers computer systems, operating systems, office productivity tools, computer networks, Internet technologies, databases, cloud computing, cybersecurity, and emerging digital technologies. The course develops essential digital literacy skills that enable students to effectively create, manage, communicate, and protect digital information.

Course Objectives:

1. To understand the fundamentals of computer systems and their components.
2. To develop proficiency in operating systems and office productivity applications.
3. To understand computer networks, Internet technologies, and cloud computing.
4. To introduce databases, information systems, and emerging digital technologies.
5. To develop awareness of cybersecurity, digital ethics, and responsible digital citizenship.

Unit - I	Fundamentals of Computing	9 Hrs

Introduction of Computers, Characteristics and Classification of Computers, Functional Units of a Computer, Computer Hardware, Input and Output Devices, Memory and Storage Devices, Number Systems, Software Classification, Applications of Computers in Various Domains.

Unit - II	Operating Systems and Office Productivity	9 Hrs

Operating Systems and Functions, Windows and Linux Environment, File and Folder Management, Utility Software, Word Processing, Spreadsheet Applications, Presentation Software, Digital Documentation, PDF Tools, File Compression, Printing and Document Sharing.

Unit - III	Computer Networks and Internet Technologies	9 Hrs

Data Communication Basics, Types of Computer Networks, Internet Architecture, World Wide Web, Web Browsers, Search Engines, E-mail, Internet Services, Cloud Computing Fundamentals, Cloud Storage, Online Collaboration Tools, Video Conferencing.

Unit - IV	Data Management and Emerging Technologies	9 Hrs

Data and Information, Introduction to Database Systems, Database Applications, Information Systems, Digital Transformation, Artificial Intelligence Fundamentals, Internet of Things (IoT), Big Data, Blockchain Technology, Applications of Emerging Technologies in Healthcare, Business and Scientific Research.

Unit - V	Cybersecurity and Digital Citizenship	9 Hrs

Information Security Fundamentals, Cyber Threats and Malware, Password Management, Authentication, Data Backup and Recovery, Privacy and Data Protection, Cyber Hygiene, Intellectual Property Rights, Copyright, Plagiarism, Digital Ethics, Responsible Use of Artificial Intelligence, Safe and Responsible Use of Digital Technologies.

Total Hours	45 Hrs

Course Outcomes:	POs	PSOs	Peak BTL
1. Explain the basic concepts and components of computer systems.	PO1, PO5	PSO1, PSO2	**L2**
2. Use operating systems and office productivity tools effectively.	PO5	PSO2	**L3**
3. Apply Internet technologies and cloud computing services for communication and collaboration.	PO5, PO6	PSO2	**L3**
4. Explain the concepts of databases and emerging digital technologies.	PO1, PO12	PSO1	**L2**
5. Practice cybersecurity measures and demonstrate responsible digital citizenship.	PO6, PO8	PSO3	**L3**

Text Books:

1. P. K. Sinha and Priti Sinha, Computer Fundamentals, BPB Publications.
2. Anita Goel, Computer Fundamentals, Pearson Education.

Reference Books:

1. V. Rajaraman, Fundamentals of Computers, PHI Learning.
2. Alexis Leon and Mathews Leon, Introduction to Computers, Leon Tech World.
3. Brian W. Kernighan, Understanding the Digital World: What You Need to Know about Computers, the Internet, Privacy, and Security, Princeton University Press.
4. Ramesh Bangia, Computer Fundamentals and Information Technology, Firewall Media

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**2**				**2**								**2**	**2**	
CO2					**3**									**3**	
CO3					**3**	**2**								**3**	
CO4	**2**											**2**	**2**		
CO5						**2**		**2**							**2**
CO*	**2.0**				**2.7**	**2.0**		**2.0**				**2.0**	**2.0**	**2.7**	**2.0**

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT1201Q	ETHICAL HACKING	L	T	P	C
		3	0	0	3

Prerequisite: Computer Networks (recommended).

Course Description:

This course is about learning ethical hacking and security challenges in computer networking. It addresses data security issues and types of attacks including malware, viruses, sniffers and denial of service. It teaches ethical responsibilities, professional integrity and the appropriate use of the tools and techniques associated with ethical hacking.

Course Objectives:

6. Know the concepts of hacking, ports and penetration testing.
7. Understand footprinting types and techniques of scanning.
8. Understand the process of system hacking, trojans and backdoors.
9. Apply the concepts of sniffing, packet analysis and session hijacking.
10. Learn the ethical issues and responsibilities associated with ethical hacking.

Unit - I	Introduction to Hacking, Ports and Penetration Testing	9 Hrs

Introduction to Hacking: Hacking, Types and Phases of Hacking. Introduction to Ports and Protocols: Ports, Protocols, Primary Network Types. Introduction to Penetration Testing: Penetration Test, Categories and Types of Penetration Tests, Structure of a Penetration Test Report.

Unit - II	Footprinting and Scanning	9 Hrs

Footprinting: Footprinting, Types, Using Ping and NSLookup Commands in Windows Command Line. Scanning: Scanning, Basics of Scanning, Basic Techniques of Scanning, Enumerating DNS using dnsenum, Performing Flag Scan using hping3.

Unit - III	System Hacking, Trojans and Backdoors	10 Hrs

System Hacking: System Hacking, Password Cracking, Default Password Databases, Manual and Automated Password Cracking, Process of System Hacking, Using Keyloggers. Trojans and Backdoors: Trojans, Working of Trojans, Infection Techniques, Attack, Lifecycle and Classification of Viruses, Worms, Virus Construction Kit.

Unit - IV	Sniffing, Packet Analysis, Session Hijacking and Cryptography	9 Hrs

Sniffing, Packet Analysis and Session Hijacking: Sniffing, Packet Analysis, Types of Sniffing, Active and Passive Sniffing Techniques, Session Hijacking. Cryptography: Cryptography, Digital Signature, Hash Functions.

Unit - V	Legal, Professional and Ethical Issues	8 Hrs

An Introduction to the Particular Legal, Professional and Ethical Issues Likely to be Faced in the Domain of Ethical Hacking. Ethical Responsibilities, Professional Integrity and Making Appropriate Use of the Tools and Techniques Associated with Ethical Hacking.

Total Hours	45 Hrs

Course Outcomes:	POs	PSOs	Peak BTL
1. Explain the concepts related to hacking, ports and protocols, and penetration testing.	PO1, PO12	1	2
2. Determine the applicable footprinting techniques and scanning methods.	PO1, PO2, PO5	1,3	3
3. Explain the process of system hacking and the concepts of trojans, backdoors, worms and viruses, and their countermeasures.	PO1, PO2, PO5	1,3	3

4. Demonstrate a systematic understanding of the concepts of sniffing and cryptography.	PO1, PO2, PO5	**1,3**	**3**
5. Understand the legal and professional responsibilities of ethical hacking.	PO6, PO8, PO12	**2**	**2**

Text Books:

1. Harsh Bothra, Hacking: Be a Hacker with Ethics, Khanna Publications, 2019.
2. Rafay Baloch, Ethical Hacking and Penetration Testing Guide, 2014.

Reference Books:

1. SVivek Ramachandran and Cameron Buchanan, Kali Linux Wireless Penetration Testing Beginner's Guide, Packt Publishing, 2015.
2. Justin Clarke-Salt, SQL Injection Attacks and Defense, 1/e, Syngress Publication.
3. Prakhar Prasad, Mastering Modern Web Penetration Testing, Packt Publishing, 2016.

Web Links (Online Source):

3. https://nptel.ac.in/courses/106105217
4. https://onlinecourses.nptel.ac.in/noc25_cs142/preview

CO-POs/PSOs Mapping

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**											**1**	**2**		
CO2	**2**	**2**			**2**								**3**		
CO3	**2**	**2**			**2**								**3**		
CO4	**2**	**2**			**3**								**3**		
CO5						**1**		**3**				**1**		**2**	
CO*	**2.2**	**2.0**			**2.3**	**1.0**		**3.0**				**1.0**	**2.8**	**2.0**	

Level: 3 – High, 2 – Moderate, 1 - LowS

SEMESTER-II

26SOTT1703	Probability & Statistics (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		3	1	0	4

Prerequisite: Linear Algebra & Multi Variable Calculus

Course Description:

This course introduces the fundamental concepts of probability and statistics for engineering applications. It covers descriptive statistics, probability theory, random variables, and probability distributions. Students learn statistical inference techniques, including estimation, hypothesis testing, and confidence intervals. The course also includes large and small sample tests, regression, correlation, and ANOVA for data analysis. It equips students with analytical and decision-making skills required for engineering, research, and data science applications.

Course Objectives:

1. To familiarize students with the foundations of probability and statistical methods.
2. To summarize the basic concepts of data science and its importance in engineering.
3. To impart probability concepts and statistical methods in various engineering applications.
4. To compute conditional probabilities directly and using Bayes' theorem, and check for independence of events.
5. To understand the law of large numbers and the central limit theorem and how these concepts are used to model various random phenomena.

Unit - I	Descriptive Statistics	12 Hrs

Statistics Introduction, Measures of Variability (Dispersion), Skewness, Kurtosis, Correlation, Correlation Coefficient, Rank Correlation, Principle of Least Squares, Method of Least Squares, Regression Lines, Regression Coefficients and their Properties.

Unit - II	Probability	12 Hrs

Probability, Probability Axioms, Addition Law and Multiplicative Law of Probability, Conditional Probability, Bayes' Theorem, Probability Density Functions and Some of its Applications.

Unit - III	Random Variables & Probability Distributions	12 Hrs

Random Variables (Discrete and Continuous), Probability Density Functions, Properties, Mathematical Expectation. Probability Distributions: Binomial, Poisson and Normal Distributions and their Properties.

Unit - IV	Estimation and Testing of Hypothesis, Large Sample Tests	12 Hrs

Estimation: Parameters, Statistics, Sampling Distribution, Point Estimation; Formulation of Null Hypothesis, Alternative Hypothesis, Critical and Acceptance Regions, Level of Significance, Types of Errors and Power of the Test. Large Sample Tests: Test for Single Proportion, Difference of Proportions, Test for Single Mean and Difference of Means, Confidence Intervals for Parameters in One-Sample and Two-Sample Problems.

Unit - V	Small Sample Tests	12 Hrs

Student's t-Distribution (Test for Single Mean, Two Means and Paired t-Test); Testing of Equality of Variances (F-Test); χ^2-Test for Single Variance; χ^2-Test for Goodness of Fit; One-Way ANOVA Classification.

Total Hours	60 Hrs

Course Outcomes:	POs	PSOs	Peak BTL
1. Evaluate correlation and regression for the given data.	PO1, PO2	1,2	3
2. Apply Bayes' theorem to probabilistic experiments.	PO1, PO2	1,2	3
3. Apply discrete and continuous probability distributions to real-time problems.	PO1, PO2	1,2	3

4. Design the components of a classical hypothesis test.	PO1, PO2	**1,2**	**4**
5. Infer statistical conclusions using small sample tests.	PO1, PO2, PO5	**1,2**	**5**

Text Books:

1. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand and Sons Publications, 2012.
2. Veerarajan T., Probability, Statistics and Random Processes, 3/e, Tata McGraw-Hill, New Delhi, 2008.
3. Iyengar T.K.V, Krishna Gandhi B, et al., Probability and Statistics, S. Chand, 7/e, 2022.

Reference Books:

1. N.P. Bali and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications, 2008.
2. T. K. V. Iyengar, B. Krishna Gandhi and Others, Probability & Statistics, S. Chand & Company.
3. Miller and John E. Freund, Probability & Statistics for Engineers, Prentice Hall of India.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44/e, 2017.
5. Sheldon M. Ross, Introduction to Probability and Statistics for Engineers and Scientists, Academic Press, 2009.
6. Ronald E. Walpole, Sharon L. Myers, Keying Ye, Probability and Statistics for Engineers and Scientists, Pearson, 2007.

Web Links (Online Source):

1. https://nptel.ac.in/courses/111105090
2. https://www.slideshare.net/ItishreeDash3/a-study-on-probablty-statistics-and-its-applications

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**2**											**2**		
CO2	**3**	**3**											**2**		
CO3	**3**	**3**											**1**	**1**	
CO4	**3**	**2**											**1**		
CO5	**3**	**3**			**2**								**2**	**1**	
CO*	**3.0**	**2.6**			**2.0**								**1.6**	**1.0**	

Level: 3 – High, 2 – Moderate, 1 - Low

26SOTT1802	**Basic Electrical and Electronics Engineering**	L	T	P	C
	(Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	3	0	0	3

Prerequisite: Engineering Physics.

Course Description:

This course provides an introduction to electrical and electronic engineering covering the basic electric circuit quantities and circuit analysis techniques; semiconductor devices such as diodes, transistors and oscillators and their application; and finally electrical energy, machines and power systems. It is designed to give a broad understanding of the principles of electrical and electronic engineering.

Course Objectives:

1. To facilitate understanding of KVL, KCL, and theorems of electrical circuits.
2. To impart basic knowledge of electrical quantities and provide working knowledge for the analysis of DC and AC circuits.
3. To understand the construction and working principle of DC and AC machines.
4. To introduce the basic principles and operation of all electrical and electronics components.
5. To understand the basics of Operational Amplifiers.

Unit - I	**Fundamentals of Electrical Circuits**	**9 Hrs**

Ohm's Law, Kirchhoff Laws (KVL, KCL), Superposition and Reciprocity Theorem. Representation of Sinusoidal Waveforms, Instantaneous Values, RMS Values, Average Values, Form Factor, Peak Factor. Single-Phase AC Circuits: R, L, C, RL, RC, RLC Circuits, Power Factor, Power.

Unit - II	**Transformers and Machines**	**9 Hrs**

Working Principles of a Single-Phase Transformer, EMF Equation; Working and Applications of Permanent Magnet DC Motor, Brushless DC Motor, DC Generator, Three Phase Induction Motor; Working and Applications of Stepper Motor, Capacitor Start and Run Motor.

Unit - III	**Diodes and their Applications**	**9 Hrs**

Diode Equivalent Circuits, Diode Applications: Half Wave Rectifier, Full Wave Bridge Rectifier, Capacitor Filter Circuit (only qualitative approach), Clippers and Clampers. Zener Diode and its use in Voltage Regulation, SCR Operation and Applications.

Unit - IV	**Transistors and their Applications**	**9 Hrs**

Bipolar Junction Transistor: Construction and Operation, Common Emitter Characteristics, BJT as a Switch and Amplifier. Field Effect Transistor: Construction, Drain and Transfer Characteristics of n-channel Enhancement and Depletion Mode MOSFET, CMOS Inverter.

Unit - V	**Op-Amp & Linear IC Applications**	**9 Hrs**

Introduction, Op-Amp Specifications, Differential & Common-Mode Operation, Op-Amp Applications: Inverting/Non-Inverting Amplifier, Inverting Summer, Integrator, Differentiator, Comparator. 78XX Series IC Voltage Regulator.

Total Hours	**45 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Analyse electrical circuits by applying the conceptual knowledge of circuit concepts.	PO1, PO2, PO3	**1**	**4**
2. Interpret the construction and working of different types of electrical machines.	PO1, PO2, PO3	**1,2**	**4**
3. Demonstrate knowledge on characteristics and applications of diodes.	PO1, PO2, PO3	**1,2**	**3**

4. Demonstrate knowledge on characteristics and applications of BJT and FET.	PO1, PO2, PO3	**1**	**3**
5. Apply operational amplifiers in the design of amplifiers and other circuits.	PO1, PO2, PO3	**1,2**	**3**

Text Books:

1. Basic Electrical Engineering, V. K. Mehta and Rohit Mehta, S. Chand and Company Publishers, RE 2012, ISBN 81219087.
2. Fundamentals of Electrical and Electronics Engineering, B. L. Theraja, S. Chand and Company, Reprint 2013, ISBN 8121926602.
3. Electronics Devices and Circuits, R. L. Boylestad and Louis Nashelsky, PHI, 11/e, 2015.
4. Linear Integrated Circuits, D. Roy Choudhury and Shail B. Jain, New Age International, 4/e.

Reference Books:

1. Introduction to Electrical Engineering, M.S. Naidu and S. Kamakshaiah, Tata McGraw-Hill Education, New Delhi, 2007.
2. Electronic Devices and Circuits, Dr. K. Lal Kishore, BS Publications, 2008, ISBN: 81-7800-167-5.
3. Electronic Devices and Circuits, David Bell, 5/e, Oxford University Press, 2008.

Web Links (Online Source):

1. https://www.nptel.ac.in/courses/108104139
2. https://onlinecourses-archive.nptel.ac.in/noc17_ee13/preview
3. https://www.nptel.ac.in/courses/108105112

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**3**	**2**										**3**		**3**
CO2	**3**	**2**	**2**										**3**	**2**	**3**
CO3	**3**	**2**	**1**										**3**	**3**	**3**
CO4	**3**	**3**	**1**											**3**	
CO5	**3**	**2**	**1**										**2**	**3**	**2**
CO*	**3.0**	**2.4**	**1.4**										**2.8**	**2.8**	**2.8**

Level: 3 – High, 2 – Moderate, 1 - Low

26SOTT1301	**Data Structures** **(Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

Course Description:

This course introduces the fundamental concepts of C++ programming and their application in implementing data structures. It covers the design, implementation, and analysis of linear and non-linear data structures, along with searching, sorting, hashing, and graph algorithms. Students will learn to analyze algorithm efficiency and develop optimized solutions for computational and real-world problems using C++.

Course Objectives:

The objective of this course is to make students to,

1. Understand the fundamentals of C++, object-oriented programming and Abstract data types
2. Implement searching techniques and linked list data structures.
3. Apply stack and queue data structures to solve computational problems.
4. Analyze and implement sorting and hashing techniques for efficient data processing.
5. Apply tree and graph data structures and traversal algorithms to solve real-world problems.

Unit - I	**C++ Programming Fundamentals and Data Abstraction**	**13 Hrs**

Introduction to C++, Fundamentals of C++, Object-Oriented Programming in C++, C++ Class Overview-Class Definition, Objects, Accessing Class Members, Constructors and Destructors, Special Member Functions- Inline functions, this pointer, friend functions, Dynamic Memory Allocation, Exception handling, Template, Abstract Data Types (ADTs).

Unit - II	**Linear Data Structures**	**11 Hrs**

Searching -Linear and Binary Search, Linked Lists -Singly, Doubly and Circular Linked Lists, Applications of Linked Lists.

Unit - III	**Stack and Queues**	**12 Hrs**

Stack ADT, Queue ADT, Circular Queue, Deque, Priority Queue, Applications of Stacks and Queues, Expression Conversion and Evaluation.

Unit - IV	**Sorting, Hashing table**	**12 Hrs**

Sorting Techniques: Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort, Heap Sort; Hashing, Hash Functions, Collision Resolution Techniques-Separate Chaining and Open Addressing, Rehashing.

Unit - V	**Trees and Graphs**	**12 Hrs**

Tree Terminology, Binary Trees, Binary Tree Traversals, Binary Search Trees, AVL Trees, Graph Terminology, Graph Representations, Graph Traversals -BFS and DFS, Minimum Spanning Trees-Prim's and Kruskal's Algorithms

Total Hours	**60 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1.Apply C++ programming concepts, object-oriented principles, and Abstract Data Types (ADTs) to develop modular programs.	PO1,PO2,PO3, PO5, PO12		**3**
2.Implement searching algorithms and linked list data structures to solve computational problems.	PO1,PO2,PO3, PO5, PO12		**3**
3.Develop solutions using stack and queue data structures for expression processing and other applications.	PO1,PO2,PO3, PO5, PO12		**3**
4.Analyze and implement sorting and hashing techniques for efficient data organization and retrieval.	PO1,PO2,PO3, PO4,PO5, PO12		**4**
5.Implement tree and graph algorithms, including traversals and Minimum Spanning Tree algorithms, to solve real-world problems.	PO1,PO2,PO3, PO4,PO5, PO12		**3**

Text Books:

1. E Balaguruswamy, ”Object oriented Programming with C++”,TMH, 4th Ed, 2008.
2. Sahani S,”Data structures Algorithms and Applications using C++”, University Press (India) Pvt. Ltd, 2nd edition, 2004.

Reference Books:

1. Adam Drozdek, “Data Structures and Algorithms in C++”, India Edition, 3rd Edition,2004.
2. Gav Pai, ”Data Structures and Algorithms”, McGraw Hill Education, 2008.
3. Ananda Rao Akepogu, Radhika Raju Palagiri,”Data structures and Algorithms using C++*”,* Pearson Education, 2010.
4. Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, Fundamentals of Data Structures in C++, 2nd Edition, Universities Press, 2008.

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2		2							1			
CO2	3	3	2		2							1			
CO3	3	3	2		2							1			
CO4	3	3	3	1	2							2			
CO5	3	3	3	2	2							2			

Level: 3 – High, 2 – Moderate, 1 - Low

26SOTT1803	Programming using Python (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		3	0	0	3

Prerequisite: Basic Programming Knowledge

Course Description:

Python is one of the most widely used programming languages in software development, data science, artificial intelligence, automation, scientific computing, cloud computing, cybersecurity, and web development. This course introduces Python programming from fundamentals to advanced concepts, emphasizing problem-solving, object-oriented programming, modular programming, file processing, exception handling, data structures, functional programming, and database connectivity. Students will also explore Python libraries for data analysis and automation through real-world case studies, preparing them for advanced computing courses and industry applications.

Course Objectives:

Upon successful completion of this course, students will be able to:

1. Understand Python syntax, programming constructs, and problem-solving techniques to develop efficient programs.
2. Apply object-oriented programming principles and modular programming concepts for developing reusable software components.
3. Utilize Python data structures, exception handling, file processing, and functional programming techniques to solve computational problems.
4. Develop applications using databases, packages, APIs, and commonly used Python libraries.
5. Design and implement real-world Python applications by integrating modern programming practices, testing methodologies, and emerging Python technologies.

Unit – I	Introduction to Python Programming	10 Hrs

Introduction to Python - Features and Applications of Python - Python Installation and Development Environment - Interactive Mode and Script Mode - Python Syntax - Variables and Identifiers - Keywords - Data Types - Input and Output - Operators and Expressions - Type Conversion - Decision Making Statements - Looping Statements - Strings and String Operations - Lists - Tuples - Sets - Dictionaries - Basic Problem Solving. **Case Studies:** Student Result Processing System and ATM Transaction Simulator.

Unit - II	Functions and Object-Oriented Programming	9 Hrs

Functions - Parameters - Recursion - Variable Scope - Modules – Packages.

Object-Oriented Programming - Classes and Objects - Constructors - Instance and Class Variables - Encapsulation - Inheritance - Method Overriding – Polymorphism.

Case Studies: Library Management System and Banking System.

Unit - III	Advanced Python Programming	9 Hrs

Exception Handling - User-defined Exceptions - File Handling - Text Files - Binary Files - CSV Files - JSON Processing - Regular Expressions - Lambda Functions - Map - Filter - Reduce - Comprehensions - Date and Time Module. **Case Studies:** Log File Analyzer and Employee Attendance System.

Unit - IV	Python Libraries, Automation and Containerization	9 Hrs

Python Packages - NumPy - Pandas - Matplotlib - Requests Library - REST APIs.

Introduction to Flask- Introduction to Docker - Python Documentation - Coding Standards (PEP 8) - Git and GitHub Integration - Package Management using pip.

Case Studies: Python for Automation, Demonstration of Git and GitHub.

Unit - V	Emerging Trends and Database Programming	8 Hrs

Emerging Trends in Python – Python for Artificial Intelligence – Python for Machine Learning and Data Science – Python for Generative AI – Python in Cloud Computing – Python in Cybersecurity – Python for Internet of Things (IoT). SQLite and Python Programming – Database Connectivity - CRUD Operations

Case Studies: Intelligent File Automation System and Smart Healthcare Analytics, Student Performance Analytics and Weather Dashboard.

Total Hours	45 Hrs

Course Outcomes:	POs	PSOs	Peak BTL
1. **Demonstrate** the fundamental concepts of Python programming, including syntax, data types, operators, control structures, functions, and modules.	PO1, PO2, PO3,PO5, PO12	**1,2,3**	**3**
2. **Apply** Python programming constructs and object-oriented programming principles to develop modular programs using classes, inheritance, polymorphism, and packages.	PO1, PO2	**1,2,3**	**4**
3. **Analyze** programming problems and implement efficient solutions using Python data structures, exception handling, file handling, and functional programming techniques.	PO1, PO2, PO3	**1,2,3**	**5**
4. **Develop** Python applications by integrating databases, REST APIs, and standard Python libraries for data processing and application development.	PO1, PO2, PO3	**1,2,3**	**6**
5. **Design** end-to-end Python applications by incorporating software engineering principles, testing techniques, version control, and modern Python development tools.	PO1, PO2, PO3, PO4, PO12	**1,2,3**	**6**

Text Books:

1. Python Crash Course, Eric Matthes, No Starch Press, 2023. ISBN: 978-1718502701.
2. Python Programming: An Introduction to Computer Science, John M. Zelle, Franklin, Beedle & Associates, 2024. ISBN: 978-1590282753.
3. Learning Python, Mark Lutz, O'Reilly Media, 2013. ISBN: 978-1449355737.

Reference Books:

1. Fluent Python, Luciano Ramalho, O'Reilly Media, 2022. ISBN: 978-1492056353.
2. Python Cookbook, David Beazley and Brian K. Jones, O'Reilly Media, 2013. ISBN: 978-1449340375.
3. Effective Python, Brett Slatkin, Addison-Wesley Professional, 2019. ISBN: 978-0134853987.
4. Think Python, Allen B. Downey, O'Reilly Media, 2015.ISBN: 978-1491939367.
5. Python for Data Analysis, Wes McKinney, O'Reilly Media, 2022. ISBN: 978-1098104038.
6. Head First Python, Paul Barry, O'Reilly Media, 2016. ISBN: 978-1491919536.

Web Links (Online Source):

1. Python Official Documentation: https://docs.python.org/3/
2. Python Tutorial (Official) - https://docs.python.org/3/tutorial/
3. Python Package Index (PyPI) - https://pypi.org/
4. PEP 8 – Style Guide for Python Code - https://peps.python.org/pep-0008/

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	–	2	–	–	–	–	–	–	2	**3**	**2**	**2**
CO2	3	3	3	1	2	–	–	–	–	–	–	2	**3**	**1**	**1**
CO3	3	3	3	2	3	–	–	–	–	–	–	2	**3**	**1**	**2**
CO4	2	3	3	2	3	–	–	–	–	–	–	2	**3**	**1**	**2**
CO5	3	3	3	2	3	–	–	–	–	–	–	3	**3**	**2**	**3**
CO*	**2.8**	**2.8**	**2.6**	**1.4**	**2.6**	**-**	**-**	**-**	**-**	**-**	**-**	**2.2**	**3.0**	**1.4**	**2.0**

Level: 3 – High, 2 – Moderate, 1 – Low

26SOTT1901	Universal Human Values (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		3	0	0	3

Prerequisite: Nil

Course Description:

Universal Human Values (UHV) course is intended to help students understand the importance of values and skills, and develop a holistic perspective on life. Students explore core values such as love, compassion, non-violence, and peace. They also learn about the basics of ethical human conduct, and how to identify and address social disparities.

Course Objectives:

1. Understand the holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Learn the basics of ethical human conduct, and how to identify and address social disparities.
3. Understand (or develop clarity on) the harmony in the human being, family, society and nature/existence, strengthening the process of self-reflection.
4. Analyze the meaning of happiness and prosperity, and how to live in harmony with others.
5. Develop commitment and courage to act.

Unit - I	Course Introduction – Need, Basic Guidelines, Content and Process for Value Education	9 Hrs

Purpose and Motivation for the Course, Recapitulation from Universal Human Values-I; Self-Exploration – What is it? Its Content and Process; 'Natural Acceptance' and Experiential Validation as the Process for Self-Exploration; Continuous Happiness and Prosperity – A Look at Basic Human Aspirations; Right Understanding, Relationship and Physical Facility – the Basic Requirements for Fulfillment of Aspirations of Every Human Being with their Correct Priority; Understanding Happiness and Prosperity Correctly – A Critical Appraisal of the Current Scenario; Method to Fulfill the Above Human Aspirations: Understanding and Living in Harmony at Various Levels.

Unit - II	Understanding Harmony in the Human Being – Harmony in Myself	9 Hrs

Understanding Human Being as a Co-Existence of the Sentient 'I' and the Material 'Body'; Understanding the Needs of Self ('I') and 'Body' – Happiness and Physical Facility; Understanding the Body as an Instrument of 'I' (I being the Doer, Seer and Enjoyer); Understanding the Characteristics and Activities of 'I' and Harmony in 'I'; Understanding the Harmony of I with the Body: Sanyam and Health; Correct Appraisal of Physical Needs, Meaning of Prosperity in Detail; Programs to Ensure Sanyam and Health.

Unit - III	Understanding Harmony in the Family and Society – Harmony in Human-Human Relationship	9 Hrs

Understanding Values in Human-Human Relationship; Meaning of Justice (Nine Universal Values in Relationships) and Program for its Fulfillment to Ensure Mutual Happiness; Trust and Respect as the Foundational Values of Relationship – Understanding the Meaning of Trust; Difference between Intention and Competence; Understanding the Meaning of Respect, Difference between Respect and Differentiation; the Other Salient Values in Relationship; Understanding the Harmony in Society (Society being an Extension of Family): Resolution, Prosperity, Fearlessness (Trust) and Co-Existence as Comprehensive Human Goals; Visualizing a Universal Harmonious Order in Society; Undivided Society, Universal Order from Family to World Family.

Unit - IV	Understanding Harmony in the Nature and Existence – Whole Existence as Co-Existence	9 Hrs

Understanding the Harmony in Nature – Interconnectedness and Mutual Fulfillment among the Four Orders of Nature – Recyclability and Self-Regulation in Nature; Understanding Existence as Co-Existence of Mutually Interacting Units in All-Pervasive Space; Holistic Perception of Harmony at All Levels of Existence.

Unit - V	Implications of the Above Holistic Understanding of Harmony on Professional Ethics	9 Hrs

Natural Acceptance of Human Values – Definitiveness of Ethical Human Conduct – Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order; Competence in Professional Ethics: Ability to Utilize Professional Competence for Augmenting Universal Human Order, Ability to Identify the Scope and Characteristics of People-Friendly and Eco-Friendly Production Systems, Ability to Identify and Develop Appropriate Technologies and Management Patterns for the Above Production Systems; Case Studies of Typical Holistic Technologies, Management Models and Production Systems; Strategy for Transition from the Present State to Universal Human Order at the Level of the Individual (as Socially and Ecologically Responsible Engineers, Technologists and Managers) and at the Level of Society (as Mutually Enriching Institutions and Organizations).

Total Hours			**45 Hrs**
Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity, and do a correct appraisal of the current scenario in society.	PO12	**1**	**2**
2. Distinguish between the Self and the Body, and understand the meaning of Harmony in the Self and the Co-existence of Self and Body.	PO9, PO12	**1**	**2**
3. Understand the value of harmonious relationships based on trust, respect, and other naturally acceptable feelings in human-human relationships, and explore their role in ensuring a harmonious society.	PO6, PO9	**1**	**2**
4. Understand the harmony in nature and existence, and work out mutually fulfilling participation in nature.	PO6, PO7	**1**	**3**
5. Distinguish between ethical and unethical practices, and work out the strategy to actualize a harmonious environment wherever they work.	PO6, PO8, PO12	**1,2**	**3**

Text Books:

1. R.R. Gaur, R. Asthana, G.P. Bagaria, A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019.
2. R.R. Gaur, R. Asthana, G.P. Bagaria, Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019.

Reference Books:

1. A. Nagaraj, Jeevan Vidya: Ek Parichaya, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. A.N. Tripathi, Human Values, New Age International Publishers, New Delhi, 2004.
3. The Story of Stuff (Book),
4. Mohandas Karamchand Gandhi, The Story of My Experiments with Truth.
5. E. F. Schumacher, Small Is Beautiful.
6. Cecile Andrews, Slow Is Beautiful.
7. J. C. Kumarappa, Economy of Permanence.

8. Pandit Sunderlal, Bharat Mein Angreji Raj.
9. Dharampal, Rediscovering India.
10. Mohandas K. Gandhi, Hind Swaraj or Indian Home Rule.
11. Maulana Abdul Kalam Azad, India Wins Freedom.
12. Romain Rolland, Vivekananda.
13. Romain Rolland, Gandhi.

Web Links (Online Source):

5. https://nptel.ac.in/courses/109104068
6. https://uhv.org.in/uhve

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1												**1**		**1**	
CO2									**1**			**1**		**2**	
CO3						**1**			**2**					**1**	
CO4						**1**	**2**							**2**	
CO5						**2**		**3**				**2**		**2**	
CO*						**1.3**	**2.0**	**3.0**	**1.5**			**1.3**		**1.6**	

Level: 3 – High, 2 – Moderate, 1 – Low

26SOTT1902	Environmental Studies (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		3	0	0	0

Prerequisite: Nil.

Course Description:

This course provides degree-seeking students with an array of opportunities to learn, practice and motivate communities on environmental importance. It further helps to understand the resources, optimize the resources in future days, and address the gaps in the ecosystem.

Course Objectives:

1. Understand the ecosystem and scope of multidisciplinary nature.
2. Creating the awareness about environmental problems among people.
3. Imparting basic knowledge about the environment and its allied problems.
4. Developing an attitude of concern for the environment.
5. Understand the developments in global goals.

Unit - I	Multidisciplinary Nature of Environmental Studies	8 Hrs

Definition, scope and importance; Need for public awareness. Natural Resources: Renewable and non-renewable resources; Forest resources; Water resources; Mineral resources; Food resources; Energy resources; Land resources; Equitable use of resources for sustainable lifestyles; Natural resources and associated problems.

Unit - II	Ecosystems	8 Hrs

Concept of an ecosystem; Introduction, types, characteristic features, structure and function of the following ecosystems - Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries); Environment Protection Act, 1986; Public awareness; Environment and human health.

Unit – III	Biodiversity and its Conservation	8 Hrs

Introduction - Definition - genetic, species and ecosystem diversity; Biogeographical classification of India; India as a mega-diversity nation; Hot-spots of biodiversity; Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; Endangered and endemic species of India; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit - IV	Environmental Pollution	8 Hrs

Definition; Cause, effects and control measures of Air pollution; Water pollution; Soil pollution; Marine pollution; Noise pollution; Thermal pollution and nuclear hazards; Solid Waste Management: Causes, effects and control measures of urban and industrial wastes; Role of an individual in prevention of pollution; Disaster management: floods, earthquake, cyclone and landslides.

Unit - V	Social Issues and the Environment	8 Hrs

From Unsustainable to Sustainable development; Water conservation - rain water harvesting - watershed management; Resettlement and rehabilitation of people, its problems and concerns; Environmental ethics: Issues and possible solutions; Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust; Wasteland reclamation; Consumerism and waste products; Population and environment.

Field Work	5 Hrs

Field visits to nearby sites; awareness campaign; special lectures by experts; quiz, debate competitions, short film `Contest, rally etc

Total Hours	45 Hrs

Course Outcomes:	POs	PSOs	Peak BTL
1. Understand key concepts from economic, political, and social	PO1, PO6,	2	2

analysis as they pertain to the design and evaluation of environmental policies and institutions.	PO7		
2. Appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving.	PO1, PO2, PO7	1,2	3
3. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.	PO6, PO7, PO8	2	2
4. Reflect critically about their roles and identities as citizens, consumers and environmental activists.	PO6, PO8, PO12	2	4
5. Participate in Development Goals and educating the communities.	PO6, PO7, PO9, PO12	2,3	3

Text Books:

1. D. K. Asthana, Textbook of Environmental Studies, S. Chand and Company, New Delhi.
2. Erach B. Bharucha, Textbook of Environmental Studies for Undergraduate Courses, UGC, Kindle Edition, Amazon.

Reference Books:

1. Encyclopedia of Environment and Society (5 Volumes), Sage Publications.

Web Links (Online Source):

1. https://nptel.ac.in/courses/109105203
2. https://onlinecourses.nptel.ac.in/noc26_ge27/preview

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2					3	2							2	
CO2	3	2					2						1	2	
CO3						2	2	2						2	
CO4						3		2				1		3	
CO5						3	2		1			1		3	1
CO*	2.5	2.0				2.8	2.0	2.0	1.0			1.0	1.0	2.4	1.0

Level: 3 – High, 2 – Moderate, 1 - Low

26SOTT1803	**Basic Electrical and Electronics Engineering Lab** **(Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**

Prerequisite: Engineering Physics.

Course Description:

This laboratory course provides hands-on experience with fundamental electrical quantities such as current, voltage, power, energy, and frequency, and their significance in electrical systems, enabling students to appreciate the impact of electrical technology in global and societal contexts. It also covers the fundamentals of modern electronics, including semiconductor devices and operational amplifiers (Op-Amps), and their application in designing basic electronic circuits such as amplifiers, while helping students recognize their capabilities, limitations, and appropriate applications.

Course Objectives:

1. To facilitate understanding of KVL, KCL, and theorems of electrical circuits.
2. To impart basic knowledge of electrical quantities and provide working knowledge for the analysis of DC and AC circuits.
3. To identify, specify and test active devices, diodes, BJTs, and low power JFETs.
4. To analyze the characteristics and operation of PN junction and Zener diodes, and demonstrate the working of half-wave and full-wave rectifier circuits.
5. To demonstrate the input and output characteristics of a Common Emitter (CE) transistor and explain its application as an amplifier, along with the fundamentals and basic applications of Operational Amplifiers (Op-Amps).

List of Experiments:

Exp. No	**Title of the Experiment**	**COs**
Minimum of TEN Experiments (Both Part A and Part B) are to be Conducted.		
PART-A: Basic Electrical Engineering		
1	Verification of Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL).	CO1
2	Measurement of Voltage, Current, and Power in DC Circuits.	CO1
3	Verification of the Superposition Theorem.	CO1
4	Study of RC Low-Pass and High-Pass Filter Circuits.	CO2
5	Study of the Transient Response of Series RL and RC Circuits under DC Excitation.	CO2
6	Verification of Resonance in a Series RLC Circuit and calculation of Impedance and Current in RL, RC, and RLC Series Circuits.	CO2
7	Measurement of Voltage, Current, and Real Power in the Primary and Secondary Circuits of a Single-Phase Transformer.	CO2
8	Determination of Power Factor in a Single-Phase AC Circuit.	CO2
PART-B: Basic Electronics		
9	Study of the V–I Characteristics of a PN Junction Diode.	CO3
10	Study of the V–I Characteristics of a Zener Diode.	CO3
11	Design and Analysis of a Half-Wave Rectifier and Full-Wave Rectifier.	CO3
12	Design and Verification of a Diode Clipper Circuit.	CO3
13	Study of the Input and Output Characteristics of a Bipolar Junction Transistor (BJT) in Common-Base (CB) Configuration.	CO4
14	Study of the Input and Output Characteristics of a Bipolar Junction Transistor (BJT) in Common-Emitter (CE) Configuration.	CO4
15	Frequency Response Analysis of a Common-Emitter (CE) Amplifier.	CO5

16	Design and Verification of Inverting and Non-Inverting Operational Amplifier (Op-Amp) Circuits.	CO5
Total Hours		**45 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Analyze, interpret, and validate practical observations by applying the fundamental principles of electrical circuits, including KCL, KVL, and network theorems.	PO1, PO2, PO3, PO4, PO6	**1,3**	**4**
2. Analyze and evaluate the performance of DC and AC circuits and transformers by measuring and interpreting electrical quantities such as voltage, current, power, impedance, and frequency.	PO1, PO2, PO3, PO6, PO7	**1,2,3**	**5**
3. Identify, test, and analyze the characteristics of semiconductor devices, including PN junction diodes and Zener diodes, and evaluate the performance of half-wave and full-wave rectifier circuits.	PO1, PO2, PO3	**1,3**	**4**
4. Design, implement, and analyze the characteristics of Bipolar Junction Transistors (BJTs) and Junction Field Effect Transistors (JFETs).	PO2, PO3	**1,3**	**5**
5. Design and analyze Common Emitter (CE) amplifier and basic Operational Amplifier (Op-Amp) circuits to meet specified performance requirements.	PO2, PO3	**1,3**	**5**

Reference Books:

1. Ashfaq Hussain, Fundamentals of Electrical Engineering, Dhanpatrai & Co. (P) Ltd., 3/e, New Delhi, 2009.
2. B.L. Theraja and A.K. Theraja, A Text Book of Electrical Technology, Volume 1, S Chand Technical Publications, 1/e, 2005.
3. R. L. Boylestad and Louis Nashelsky, Electronics Devices and Circuits, PHI, 11/e, 2009.
4. D. Roy Chowdhury, Linear Integrated Circuits, New Age International Pvt. Ltd., 4/e, 2011.
5. V. K. Mehta, Principles of Electronics, S. Chand Publications, 2/e.

Web Links (Online Source):

1. https://nptel.ac.in/courses/117106108
2. https://nptel.ac.in/courses/117103063

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1		1							3		1
CO2	3	3	1			1	1						3	2	2
CO3	3	3	1										3		2
CO4	3	3	3										3		2
CO5	3	3	3										3		2

Level: 3 – High, 2 – Moderate, 1 – Low

26SOTL1301	**Data Structures Lab**	**L**	**T**	**P**	**C**
	(Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	**0**	**0**	**2**	**1**

Course Description:

This lab course is intended to make students to implement various techniques, algorithms of data structures which can make them more effective designer, developer.

Course Objectives:

The objective of this course is to make students to,

1. Gain knowledge and get familiarize with C++.
2. Learn the implementation of linear data structures.
3. Understand searching, sorting, and hashing techniques.
4. Learn tree and graph data structures and their traversals.
5. Understand graph algorithms for constructing Minimum Spanning Trees.

List of Experiments

Exp. No.	Title of the Experiment	COs
1	a) To implement a C++ program for Classes, Objects, Constructors, and Destructors. b) To implement a C++ program using Inline Functions and Friend Functions.	CO1
2	Write a C++ program that uses functions to perform the following operations on singly linked list. i) Creation ii) Insertion iii) Deletion iv) Traversal	CO2
3	Write a C++ program that uses functions to perform the following operations on doubly linked list. i) Creation ii) Insertion iii) Deletion iv) Traversal	CO2
4	Write a C++ program to perform Linear Search and Binary Search for a given key element in an array and display its position.	CO3
5	Write a C++ program using Stack ADT implemented with Linked List to perform the following operations: a) Infix to Postfix Expression Conversion. b) Postfix Expression Evaluation.	CO2
6	Implement a C++ program to perform the fundamental operations of Linear Queue and Circular Queue using arrays.	CO2
7	Write a C++ program that implements the following sorting methods to sort a given list of integers in ascending order i) Bubble sort ii) Selection sort iii) Insertion sort iv) Merge Sort v) Quick sort	CO3
8	Implement a C++ program to perform insertion, searching, and deletion operations in a Hash Table using an appropriate Hash Function, Collision Resolution Techniques (Separate Chaining and Open Addressing), and Rehashing.	CO3
9	A) Write a C++ program that uses functions to perform the following Binary Tree Traversals a) Inorder b) Preorder c) Postorder B) Write a C++ program to implement the following graph traversals a) Depth-First Search b) Breadth- First Search	CO4
10	Write a C++ program to construct the Minimum Spanning Tree (MST) of a connected weighted graph using Prim's and Kruskal's Algorithms.	CO5
Total Hours		**30 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Develop C++ programs using object-oriented programming concepts.	PO1, PO2, PO3, PO5, PO12	**1**	**3**
2. Implement linear data structures such as linked lists, stacks, and queues.	PO1, PO2, PO3, PO5,	**1,2**	**3**

	PO12		
3. Apply searching, sorting, and hashing techniques to solve computational problems	PO1, PO2, PO3, PO4, PO5, PO12	**1,2**	**3**
4. Design and implement tree and graph traversal algorithms	PO1, PO2, PO3, PO4, PO5, PO12	**2,3**	**3**
5. Construct Minimum Spanning Trees using Prim's and Kruskal's algorithms.	PO1, PO2, PO3, PO4, PO5, PO12	**2,3**	**4**

Text books:

1. D. S. Malik, *Data Structures Using C++*, 2nd Edition, Cengage Learning, 2011.

Reference Books:

1. Ellis Horowitz, Sartaj Sahni, and Dinesh Mehta, *Fundamentals of Data Structures in C++*, 2nd Edition, Universities Press, 2007.
2. Bjarne Stroustrup, *Programming: Principles and Practice Using C++*, 2nd Edition, Addison-Wesley, 2014.

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**2**	**2**		**2**							**1**	**3**	**1**	
CO2	**3**	**3**	**2**		**2**							**1**	**3**	**2**	**1**
CO3	**3**	**3**	**3**	**2**	**2**							**2**	**3**	**3**	**1**
CO4	**3**	**3**	**3**	**2**	**2**							**2**	**2**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**2**							**2**	**1**	**3**	**3**

Level: 3 – High, 2 – Moderate, 1 - Low

26SOTL1804	Python Programming Lab (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		0	0	2	1

Prerequisite: Basic of Computer.

Course Description:

The **Python Programming Laboratory** provides practical exposure to Python programming through problem-solving, object-oriented programming, modular programming, exception handling, file processing, data analysis, web technologies, automation, containerization, and database programming. Students develop industry-relevant programming skills by implementing real-world applications using Python and popular libraries such as NumPy, Pandas, Matplotlib, Flask, Streamlit, SQLite, and Docker. The laboratory emphasizes software engineering best practices, Git-based version control, package management, and collaborative development, preparing students for advanced courses in Artificial Intelligence, Data Science, Machine Learning, Cloud Computing, and Software Engineering.

Course Objectives:

Upon successful completion of the laboratory, students will be able to:

1. Develop Python programs using programming fundamentals, functions, modules, and object-oriented programming concepts.
2. Apply exception handling, file processing, and advanced Python programming techniques to solve computational problems.
3. Utilize Python libraries for data analysis, visualization, APIs, web development, and automation.
4. Develop database-driven applications using SQLite/MySQL and integrate external services using REST APIs.
5. Build complete Python applications following modern software development practices including Git, Docker, virtual environments, and package management.

Software Requirements

Operating System

- Windows 10/11
- Ubuntu Linux 22.04 or later

Programming Language

- Python 3.11 or later

Development Environment

- Visual Studio Code/PyCharm Community Edition/Spyder/Jupyter Notebook/Google Colab

Python Packages

- NumPy
- Pandas
- Matplotlib
- Seaborn
- Requests
- BeautifulSoup4
- Flask
- Streamlit
- SQLite3
- mysql-connector-python

Development Tools

- Git
- GitHub
- Docker Desktop

- pip Package Manager
- Virtual Environment (venv)

ssList of Laboratory Experiments

Experiment 1

Develop Python programs demonstrating variables, data types, operators, input/output, conditional statements, loops, and string manipulations.

Experiment 2

Develop programs using Lists, Tuples, Sets, and Dictionaries to perform searching, sorting, frequency counting, and data processing.

Experiment 3

Implement Python functions using positional, keyword, and default arguments, recursion, modules, and packages.

Experiment 4

Design and implement Object-Oriented Programming applications using classes, constructors, inheritance, polymorphism, abstraction, and magic methods.

Experiment 5

Develop applications demonstrating exception handling, user-defined exceptions, assertions, and debugging techniques.

Experiment 6

Develop applications to perform file operations on text, binary, CSV, and JSON files.

Experiment 7

Implement applications using regular expressions, lambda expressions, comprehensions, iterators, generators, decorators, map(), filter(), and reduce().

Experiment 8

Perform data analysis and visualization using NumPy, Pandas, Matplotlib, and Seaborn on real-world datasets.

Experiment 9

Develop applications using REST APIs, Requests library, BeautifulSoup for web scraping, and build a simple Flask or Streamlit application.

Experiment 10

Demonstrate virtual environments, package installation using pip, Git and GitHub integration, Docker containerization, and Python automation scripts.

Experiment 11

Develop database applications using SQLite/MySQL implementing CRUD operations with appropriate exception handling.

Experiment 12

Mini Project: Develop an end-to-end Python application integrating object-oriented programming, file handling, database connectivity, REST APIs, automation, Docker deployment, and data visualization.

Suggested Mini Projects

- Student Result Management System
- Library Management System
- Banking Management System
- Employee Attendance System
- Intelligent File Automation System
- Weather Dashboard
- Student Performance Analytics
- Smart Healthcare Analytics
- Expense Tracker
- Inventory Management System

Note: Students are encouraged to use Polars for data processing and DuckdB

Total Hours	**30 Hrs**

Course Outcomes:	POs	PSOs	Peak BTL
1. Analyze Python programs using programming fundamentals, data structures, functions, modules, and object-oriented programming principles.	PO1, PO2, PO3,PO5, PO12	**1,2,3**	**3**
2. Implement robust Python applications using exception handling, file processing, and advanced programming constructs.	PO1, PO2	**1,2,3**	**3**
3. Apply Python libraries for scientific computing, data analysis, visualization, APIs, and web application development.	PO1, PO2, PO3	**1,2,3**	**4**
4. Develop database-driven applications and integrate modern development tools such as Git, Docker, and virtual environments.	PO1, PO2, PO3	**1,2,3**	**6**
5. Design and implement end-to-end Python software applications by integrating modern programming practices and industry-standard tools.	PO1, PO2, PO3, PO4, PO12	**1,2,3**	**6**

Text Books:

1. Eric Matthes, **Python Crash Course**, 3rd Edition, No Starch Press, 2023.
2. Mark Lutz, **Learning Python**, 5th Edition, O'Reilly Media.
3. Wes McKinney, **Python for Data Analysis**, 3rd Edition, O'Reilly Media, 2022.
4. Luciano Ramalho, **Fluent Python**, 2nd Edition, O'Reilly Media, 2022.

Reference Books:

1. Brett Slatkin, **Effective Python**, 2nd Edition, Addison-Wesley Professional, 2019.
2. David Beazley and Brian K. Jones, **Python Cookbook**, 3rd Edition, O'Reilly Media.
3. Allen B. Downey, **Think Python**, 2nd Edition, O'Reilly Media.
4. Paul Barry, **Head First Python**, 2nd Edition, O'Reilly Media.
5. Miguel Grinberg, **Flask Web Development**, 2nd Edition, O'Reilly Media.
6. Aurélien Géron, **Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow**, 3rd Edition, O'Reilly Media, 2023.

Web Links (Online Source):

1. Python Official Documentation: https://docs.python.org/3/
2. Python Tutorial (Official) - https://docs.python.org/3/tutorial/
3. Python Package Index (PyPI) - https://pypi.org/
4. PEP 8 – Style Guide for Python Code - https://peps.python.org/pep-0008/

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	–	–	–	–	–	–	2	**3**	**2**	**1**
CO2	3	3	2	2	3	–	–	–	–	–	–	2	**3**	**2**	**2**
CO3	3	3	3	2	3	–	–	1	–	1	–	2	**3**	**2**	**2**
CO4	3	3	3	3	3	–	–	1	–	2	1	3	**3**	**2**	**2**
CO5	3	3	3	3	3	1	1	2	1	2	1	3	**3**	**2**	**3**
CO*	**3.0**	**2.8**	**2.6**	**2.2**	**3.0**	**0.2**	**0.2**	**0.8**	**0.2**	**1.0**	**0.4**	**2.4**	**3.0**	**2.0**	**2.0**

University Elective-II

26TAUT1202A	తెలుగు (TELUGU)	L	T	P	C
		3	0	0	3

కోర్సు వివరణ:

తెలుగు భాషలో ముందస్తు పరిజ్ఞానం లేని విద్యార్థులకు ఈ కోర్సు తెలుగు భాష యొక్క ప్రాథమిక అంశాలను పరిచయం చేస్తుంది. ఇందులో తెలుగు లిపి (అచ్చులు, హల్లులు, గుణింతాలు మరియు ఒత్తులు), ప్రాథమిక వ్యాకరణం (నామవాచకాలు, సర్వనామాలు, లింగం, వచనం మరియు సరళమైన క్రియాకాలాలు), తెలుగు–సంస్కృత భాషల చారిత్రక సంబంధం మరియు దైనందిన పదజాలం ఉంటాయి. మార్గదర్శక పఠనం, లేఖనం మరియు మాట్లాడే సాధన ద్వారా విద్యార్థులు సరళమైన తెలుగు పాఠ్యాన్ని చదవడం, రాయడం మరియు ప్రాథమిక దైనందిన సంభాషణలు నిర్వహించడం నేర్చుకుంటారు.

కోర్సు లక్ష్యాలు:

ఈ కోర్సు ద్వారా విద్యార్థులు:

1. Recognize, read and write the Telugu vowels (Achulu – అచ్చులు) and consonants (Hallulu – హల్లులు) with correct pronunciation.
2. Form and use vowel signs (Guninthalu – గుణింతాలు) and consonant clusters (Vattulu – ఒత్తులు) to read and write simple words.
3. Understand basic Telugu grammar including gender, number, pronouns and simple sentence structure.
4. Use present, past and future tense verb forms to construct simple sentences.
5. Explain the historical relationship between Telugu and Sanskrit and identify Sanskrit-origin (Tatsama – తత్సమము and Tadbhava – తద్భవము) words in Telugu vocabulary.

Unit - I	Introduction to the Telugu Script	9 Hrs

తెలుగు లిపి ఆవిర్భావం మరియు లక్షణాలు; అచ్చులు – రూపాలు మరియు ఉచ్చారణ; హల్లులు – రూపాలు మరియు ఉచ్చారణ; అచ్చులు మరియు హల్లుల లేఖన సాధన; తెలుగు ఉచ్చారణ మరియు ఉచ్చారణ బలానికి సంబంధించిన ప్రాథమిక నియమాలు; తెలుగు అంకెల పరిచయం.

Unit - II	Guninthalu and Vattulu (Vowel Signs and Consonant Clusters)	9 Hrs

గుణింతాలు – హల్లులను అచ్చుల గుర్తులతో (మాత్రలతో) కలపడం; ఒత్తులు – హల్లుల సమ్మేళనాలు మరియు సంయుక్త రూపాలు; పదాలు – అక్షరం అక్షరంగా సరళమైన పదాల నిర్మాణం; రెండు మరియు మూడు అక్షరాల సరళమైన పదాలను చదవడం మరియు రాయడం; సాధారణ పదాలను గుర్తించే సాధన.

Unit - III	Conversational Telugu and Everyday Vocabulary	9 Hrs

అభివాదాలు మరియు స్వీయ పరిచయం (నమస్కారం); కుటుంబ మరియు బంధుత్వ పదాలు; సంఖ్యలు, రంగులు, వారాలు మరియు నెలలు; కొనుగోలు, ప్రయాణం మరియు దారి అడగడానికి ఉపయోగించే సాధారణ పదబంధాలు; సరళమైన సంభాషణలు మరియు పాత్రధారణ ద్వారా వినడం మరియు మాట్లాడే సాధన.

Unit - IV	Basic Grammar	9 Hrs

Lingamulu (లింగములు) – gender of nouns (masculine, feminine, neuter); Vachanalu (వచనములు) – singular and plural forms; personal, possessive and demonstrative pronouns; simple noun-based sentences; word order in Telugu sentences (Subject-Object-Verb); Kalaamulu (కాలములు) – present, past and future tense verb forms; question formation using interrogative words; negation in Telugu sentences; Vyathireka Padhaalu (వ్యతిరేక పదాలు) – opposite words; forming simple affirmative, negative and interrogative sentences.

Unit - V	Telugu–Sanskrit Relationship	9 Hrs

Telugu–Sanskrit relationship (తెలుగు–సంస్కృత సంబంధం) – the influence of Sanskrit (Samskrutam – సంస్కృతం) on Telugu vocabulary and grammar; the traditional four-fold classification of Telugu vocabulary – Achtelugu (అచ్‌తెలుగు, native Dravidian words), Tatsama (తత్సమము, Sanskrit words retained unchanged), Tadbhava (తద్భవము, Sanskrit-derived words evolved in Telugu) and Gramyam (గ్రామ్యం, colloquial/regional words); simple examples of tatsama and tadbhava word pairs and their use in everyday and formal Telugu.

మొత్తం గంటలు			45 Hrs
కోర్సు ఫలితాలు:	**POs**	**PSOs**	**Peak BTL**
1. Read and write the Telugu vowels and consonants with correct pronunciation and stroke order.	PO1, PO10	PSO1 PSO2	1
2. Form and use vowel signs and consonant clusters to read and write simple Telugu words.	PO1, PO5	PSO1 PSO2	2
3. Communicate at a basic conversational level in Telugu using everyday vocabulary and common expressions.	PO6, PO9, PO10	PSO1 PSO2 PSO3	3
4. Apply basic grammar rules of gender, number, pronouns and tense forms to construct simple Telugu sentences.	PO1, PO2, PO10	PSO1 PSO2	3
5. Explain the historical relationship between Telugu and Sanskrit and identify tatsama/tadbhava vocabulary.	PO1, PO2, PO6	PSO1 PSO3	2

పాఠ్య పుస్తకాలు:

1. Krishnamurti, Bh. and Gwynn, J. P. L. A Grammar of Modern Telugu. Oxford University Press, 1986.
2. Afsar, Mohammed and Ranjan, Rajiv. Basic Telugu. Michigan State University Libraries (Open Textbook), 2021.

సూచనా పుస్తకాలు:

1. Vemuri, V. An Introduction to Telugu Grammar.
2. Arden, A. H. A Progressive Grammar of the Telugu Language, 2nd edn. SPCK, Madras, 1905.
3. Venkatavadhani, Divakarla. Telugu in Thirty Days. Andhra Pradesh Sahitya Akademi, Hyderabad.
4. Ramanarasimham, Parimi. An Intensive Course in Telugu. Central Institute of Indian Languages, Mysore, 1985.

వెబ్ లింకులు (ఆన్‌లైన్ మూలాలు):

1. https://learn101.org/telugu.php
2. https://www.mylanguages.org/learn_telugu.php
3. https://open.umn.edu/opentextbooks/textbooks/basic-telugu

CO–POలు/PSOల అనుసంధానం

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	–	–	–	–	–	–	–	–	1	–	–	3	1	–
CO2	2	–	–	–	1	–	–	–	–	–	–	–	3	2	–
CO3	2	2	–	–	–	–	–	–	–	1	–	–	2	2	–
CO4	2	2	–	–	–	–	–	–	–	2	–	–	2	2	–
CO5	2	2	–	–	–	1	–	–	–	–	–	–	3	–	1
CO*															

స్థాయి: 3 – అధికం, 2 – మధ్యస్థం, 1 – తక్కువ

26TAUT1202B	தமிழ் (TAMIL)	L	T	P	C
		3	0	0	3

Course Description:

இந்த பாடம் மாணவர்களின் தமிழ் எழுத்து, சொல் வகை மற்றும் இலக்கண அறிவை மேம்படுத்தி, எழுதுதல், வாசிப்பு, பேச்சு மற்றும் இலக்கிய ஆர்வத்தை ஊக்குவிக்கிறது. உயிர், மெய், உயிர்மெய் எழுத்துக்கள் மற்றும் இலக்கண அம்சங்கள் கற்றல் மூலம், கடிதம், குறிப்பு, கதை வகைகளில் திறமை வளர்க்கப்படுகிறது. இந்த பாடம் மாணவர்களுக்கு அறிவு மற்றும் மொழி உணர்வை வளர்க்கும்.

Course Objectives:

1. உயிர் எழுத்துக்கள், மெய்யெழுத்து மற்றும் உயிர்மெய் எழுத்துக்களின் அடிப்படைகளை புரிந்து கொள்வது.
2. பெயர்ச்சொற்கள், பிரதிபெயர்கள், வினைச்சொற்கள் மற்றும் அவற்றின் வகைகளை நன்கறிதல்.
3. விதிவிலக்கு மற்றும் இலக்கண கட்டமைப்பை அறிதல்.
4. கடிதம் எழுதுதல், குறிப்பு வரையல், கதை சொல்லுதல் மற்றும் சொற்களை சரியான முறையில் பயன்படுத்துதல்.
5. பழமொழிகள், நன்னெறிக் கதைகள் மற்றும் திருக்குறள் போன்ற இலக்கிய துணைகளை அறிதல்.

Unit - I	**எழுத்து மற்றும் சொல் வகைகள்**	9 Hrs

உயிர் எழுத்துக்கள், மெய்யெழுத்துக்கள், உயிர்மெய் எழுத்துக்கள்; பெயர்ச்சொற்கள் மற்றும் வகைகள்; பிரதிபெயர்கள் மற்றும் வகைகள்; வினைச்சொற்கள் மற்றும் வகைகள்.

Unit - II	**இலக்கணம் - பாலினம், எண், காலம்**	9 Hrs

பாலினம், எண், காலங்கள், வழக்கு; பொருள், எதிர்ச்சொற்கள்; வாக்கியங்களில் சொற்களைப் பயன்படுத்துதல்.

Unit - III	**தமிழ் இலக்கணம் - சிறப்பு அம்சங்கள்**	9 Hrs

தமிழ் இலக்கணம் மற்றும் வகைகள்; வினைத்தொகை, பண்புத்தொகை, இரட்டைக்கிளவி, அடுக்குத்தொடர்; பிரித்தெழுத்து, சேர்த்தெழுத்து; அணி இலக்கணம்; ஒரு சொல் பல பொருள்.

Unit - IV	**கடிதம் மற்றும் குறிப்பு எழுதுதல்**	9 Hrs

உன்னை பற்றியும் குடும்பத்தை பற்றியும் குறிப்பு; தலைவரின் சுயசரிதை; தமிழ் கற்க வேண்டிய அவசியம் குறித்த கடிதம்; சுற்றுலா பற்றிய நண்பருக்கு கடிதம்; தந்தைக்கு பணம் அனுப்பக் கோரும் கடிதம்.

Unit - V	**கதை மற்றும் இலக்கியத் துணைகள்**	9 Hrs

படம் பார்த்து கதை சொல்; பழமொழிகள்; நன்னெறிக் கதைகள்; திருக்குறள்.

Total Hours	45 Hrs

Course Outcomes	POs	PSOs	Peak BTL
CO1: எழுத்துக்கள் மற்றும் சொற்களின் அடிப்படைகளை அறிவது.	PO10, PO12	PSO3	1
CO2: சொல் வகைகளை சரியாக வகைப்படுத்துதல்.	PO10	PSO3	2
CO3: இலக்கணக் கொள்கைகளை விளக்குதல்.	PO10, PO12	PSO3	2
CO4: எழுத்துத் திறனை மேம்படுத்துதல்.	PO10	PSO3	3
CO5: பல்வேறு சூழல்களில் மொழிப் பயிற்சி பெறுதல்.	PO9, PO10	PSO3	3

Text Books:
1. தமிழ் இலக்கணம் (தமிழ்நாடு அரசு வெளியீடு).
2. தமிழ் இலக்கிய வரலாறு - எம்.சு. ராமகிருஷ்ணன்.
Reference Books:
1. தமிழ் சொல் அமைப்பு மற்றும் பயன்பாடு - ஏ. இராமநாதன்.

CO-POs/PSOs Mapping															
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1										**2**		**1**			**2**
CO2										**2**					**2**
CO3										**2**		**1**			**2**
CO4										**2**					**2**
CO5									**1**	**2**					**3**
CO*									**1.0**	**2.0**		**1.0**			**2.2**

Level: 3 – High, 2 – Moderate, 1 – Low

s

26TAUT1202C	HINDI	L	T	P	C
		3	0	0	3

Course Description:

बच्चों में हिन्दी पढ़ने, लिखने की क्षमता बढ़ाना। आपस में अपनी भावनाओं को प्रकट करने की क्षमता बढ़ाना मुख्य उद्देश्य है।

Course Objectives:

1. संज्ञा, संज्ञा के प्रकार, सर्वनाम, सर्वनाम के प्रकार, क्रिया, क्रिया के प्रकार, विशेषण, विशेषण के प्रकार।
2. लिंग, वचन, काल, वाच्य, अर्थ, विलोम शब्द, शब्दों का वाक्य में प्रयोग।
3. हिंदी सीखने की आवश्यकता बताते हुए छोटी बहन के नाम पर पत्र, विहार यात्रा का वर्णन करते हुए अपने मित्र के नाम पत्र, शुल्क भरने के लिए पैसे भेजने अपने पिता के नाम पत्र।
4. कफन - प्रेमचंद, वापसी - उषा प्रियम्वदा, यशपाल - परदा।
5. सूर्यकांत त्रिपाठी निराला - जूही की कली, महादेवी वर्मा - मैं नीर भरी दुख की बदली, सुमित्रानंदन पंत - भारत माता।

Unit - I	**व्याकरण - शब्द भेद**	9 Hrs

संज्ञा, संज्ञा के प्रकार; सर्वनाम, सर्वनाम के प्रकार; क्रिया, क्रिया के प्रकार; विशेषण, विशेषण के प्रकार।

Unit - II	**व्याकरण - लिंग, वचन, काल**	9 Hrs

लिंग, वचन, काल, कारक; अर्थ, विलोम शब्द; शब्दों का वाक्य में प्रयोग।

Unit - III	**पत्र लेखन**	9 Hrs

हिंदी सीखने की आवश्यकता बताते हुए छोटी बहन के नाम पर पत्र; विहार यात्रा का वर्णन करते हुए अपने मित्र के नाम पत्र; शुल्क भरने के लिए पैसे भेजने अपने पिता के नाम पत्र।

Unit - IV	**कहानी और कहानीकार**	9 Hrs

कफन - प्रेमचंद; वापसी - उषा प्रियम्वदा; यशपाल - परदा।

Unit - V	**कवि और कविता**	9 Hrs

सूर्यकांत त्रिपाठी निराला - जूही की कली; महादेवी वर्मा - मैं नीर भरी दुख की बदली; सुमित्रानंदन पंत - भारत माता।

Total Hours	45 Hrs

Course Outcomes	POs	PSOs	Peak BTL
CO1: बच्चों में पढ़ने का क्षमता बढ़ाना।	PO10, PO12	PSO3	2
CO2: लिखने की क्षमता बढ़ाना।	PO10	PSO3	3
CO3: बोलने की क्षमता बढ़ाना।	PO10	PSO3	3
CO4: भाषा के प्रति रुचि उत्पन्न कराना।	PO12	PSO3	2
CO5: दैनंदिन जीवन में भाषा का प्रयोग करना।	PO9, PO10	PSO3	3

Text Books:

1. हिन्दी व्याकरण।
2. विश्वनाथ तिवारी की हिंदी कविता।
3. प्रेमचंद की कहानियां।

Reference Books:

1. हिन्दी व्याकरण - कांता रानी मंजूषा, हरदेव बिहारी।
2. विश्वनाथ प्रसाद तिवारी - हिंदी कविता।
3. विश्वनाथ प्रसाद तिवारी - आधुनिक हिंदी कविता।
4. पुष्पपाल सिंह - समकालीन हिंदी कविता।

CO-POs/PSOs Mapping															
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1										**2**		**1**			**2**
CO2										**2**					**2**
CO3										**3**					**3**
CO4												**2**			**2**
CO5									**1**	**2**					**3**
CO*									**1.0**	**2.3**		**1.5**			**2.4**

Level: 3 – High, 2 – Moderate, 1 – Low

26TAUT1202D	PROFESSIONAL ENGLISH	L	T	P	S
		3	0	0	3

Course Description:

English is a tool for global communication and is the dominant language which is sweeping almost all the fields in the world. It has become a necessity for people to speak in English comfortably, if they want to enter the global workforce. Hence, the course is designed to help the students to meet the global standards. Each unit focuses on English skill-set to improve: Interview skills, giving presentations and professional etiquette.

Course Objectives:

1. To enrich students to express themselves appropriately and fluently in professional contexts.
2. To enhance their employability through regular participation in group discussions and interview skills.
3. To lay foundation with writing strategies for the future workplace needs.
4. To acquaint students with different components of professional presentation skills.
5. To equip students with necessary training in listening to comprehend dialects of English language

Unit - I		**9 Hrs**
Listening	- Bill Gate's TED talk on solving big problems.	
Speaking	- Description of pictures, places, objects and persons	
Grammar	- Finite and Non-finite verbs and if clauses	
Vocabulary	- Business Vocabulary	
Writing- Writing proposal for conduction a meeting		

Unit - II		**9 Hrs**
Listening	- Google CEO Sundar Pichai's Speech I/O 2017 Keynote	
Speaking	- Oral Presentation	
Grammar	- Transformation of sentences (Types of sentences)	
Vocabulary	- Idioms and Phrasal Verbs	
Writing- Minutes of the meeting		

Unit - III		**9 Hrs**
Listening	- Dr. Prathap C Reddy (videos) Speaking Patient First, Heal India or India Must Emerge as a Global Healthcare Destination	
Speaking	- Mock Interviews	
Grammar	- Direct and Indirect Speech	
Vocabulary	- Word formation	
Writing- Academic Statement of Purpose (ASOP)		

Unit - IV		**9 Hrs**
Listening	- Video conferancing Interviews	
Speaking	- make a vlog	
Grammar	- Auxiliary Verbs	
Vocabulary	- Word Analogy-I (1.Synonym 2.Antonym 3.Cause and Effect 4. Part To Whole, 5. Object to Purpose, 6. Source To Procedure.	
Writing- Job Application I (Cover Letter)		

Unit - V		**9 Hrs**
Listening	- Tanmay Bhakshi's ITU Interview	
Speaking	- Podcast	
Grammar	- Common Errors in English	
Vocabulary	- Word Analogy-II (7. Worker to Tool 8. Tool to Product 9. Degree of Intensity 10.Action to Object 11. Category (or Type) to Example 12. Measurement)	
Writing:	- Job Application II (Resume)	

NOTE: Assessment: (Mini Projects)

- Exercises apart from the text book shall also be referred for classroom tasks.

Total Hours			**45 Hrs**
Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Use appropriate vocabulary and grammatical structures to communicate accurately in academic and professional contexts.	PO1, PO10	**PSO1 PSO2**	**3**
2. Demonstrate effective oral communication skills through self-introductions, discussions, extempore speeches, and formal presentations.	PO9, PO10, PO12	**PSO1 PSO2**	**3**
3. Apply reading strategies to comprehend, interpret, summarize, and infer information from diverse texts.	PO1, PO10	**PSO1 PSO2**	**3**
4. Produce well-organized paragraphs, letters, emails, notes, summaries, and essays using appropriate writing conventions.	PO10, PO12	**PSO1 PSO2**	**3**
5. Demonstrate professional communication skills by integrating language proficiency with digital and workplace communication practices.	PO5, PO9, PO10, PO12	**PSO1 PSO2 PSO3**	**4**

Text Books:

1. Rizvi, M. Ashraf. *Effective Technical Communication*. McGraw Hill Education (India), Latest Edition.
2. Raman, Meenakshi and Sharma, Sangeetha - Technical Communication Principles and Practice. Oxford University Press: New Delhi, 2014.

Reference Books:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Web Links (Online Source):

1. https://www.linkedin.com/learning/?utm_source=chatgpt.com
2. https://www.ted.com/talks?utm_source=chatgpt.com

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	–	–	–	1	–	–	–	–	3	–	1	2	1	–
CO2	–	–	–	–	1	–	–	–	3	3	–	2	3	2	–
CO3	2	1	–	–	–	–	–	–	–	3	–	1	2	1	–
CO4	1	–	–	–	1	–	–	–	1	3	–	2	3	2	1
CO5	–	–	–	–	3	–	–	1	2	3	–	2	3	3	2

Level: 3 – High, 2 – Moderate, 1 – Low

26TAUT1202E	संस्कृतम् (SANSKRIT)	L	T	P	C
		3	0	0	3

पाठ्यक्रमविवरणम् (Course Description):

अस्य पाठ्यक्रमस्य उद्देश्यः छात्राणां संस्कृतभाषायाः प्रारम्भिकज्ञानं प्रदातुम् अस्ति। अत्र देवनागरीलिपिः, शुद्धोच्चारणम्, प्रारम्भिकव्याकरणम्, शब्दसम्पत्तिः च मुख्यतया अध्याप्यन्ते। छात्राः सरलवाक्यानां पठनं लेखनं बोधं च कर्तुं समर्थाः भवेयुः, तथा च चयनितसाहित्यांशानां श्लोकानां च माध्यमेन संस्कृतभाषायाः सांस्कृतिकं दार्शनिकं च वैभवं ज्ञातुं शक्नुयुः।

पाठ्यक्रमलक्ष्यानि (Course Objectives):

1. देवनागरीलिपेः परिचयः शुद्धोच्चारणस्य च अभ्यासं कारयितुम्।
2. शब्दरूपाणि, सर्वनामरूपाणि, धातुरूपाणि च परिचाययितुम्।
3. सरलवाक्यरचनायाः कौशलं सन्धिसमासयोः प्राथमिकज्ञानं च विकासयितुम्।
4. सामान्यशब्दैः श्लोकैः लघुगद्यांशैश्च शब्दसम्पत्तिं वर्धयितुम्।
5. संस्कृतभाषायां प्राथमिकपठनलेखनसम्भाषणकौशलानि विकासयितुम्।

प्रकरणम् - I		**9 Hrs**

देवनागरीलिपिपरिचयः: वर्णमाला (स्वराः व्यञ्जनानि च), उच्चारणनियमाः, लेखनाभ्यासः, मूललिप्यन्तरणम्, सामान्याभिवादनवाक्यानि च।

प्रकरणम् - II		**9 Hrs**

प्राथमिकव्याकरणम् – शब्दरूपाणि: राम, बाल, फल इत्यादीनां सामान्यशब्दानां विभक्तिरूपाणां परिचयः; लिङ्गानि, वचनानि (एकवचनम्, द्विवचनम्, बहुवचनम्) च।

प्रकरणम् - III		**9 Hrs**

प्राथमिकव्याकरणम् – धातुरूपाणि: धातूनां लट्लकारे (वर्तमानकाले) रूपाणां परिचयः; कर्तृ-कर्म-क्रियापदयुक्तानां सरलवाक्यानां रचना।

प्रकरणम् - IV		**9 Hrs**

शब्दसम्पत्तिः बोधश्च: दैनन्दिनव्यवहारशब्दाः, सरलसम्भाषणवाक्यानि, लघुकथाः, बोधाभ्यासाश्च।

प्रकरणम् - V		**9 Hrs**

श्लोकाः प्रायोगिकसंस्कृतं च: सुभाषितेभ्यः भगवद्गीतायाश्च चयनितश्लोकानां पाठः अर्थबोधश्च; दैनन्दिनजीवने प्रार्थनासु सरलपत्रलेखने च संस्कृतस्य प्रयोगः।

कुलघण्टासंख्या (Total Hours)	**45 Hrs**

पाठ्यक्रमफलानि (Course Outcomes):	**POs**	**PSOs**	**Peak BTL**
पाठ्यक्रमस्य अन्ते छात्राः शक्नुवन्ति: 1. देवनागरीलिपौ शुद्धोच्चारणेन सह पठनं लेखनं च कर्तुम्।	PO1, PO10	PSO1, PSO3	**L3**
2. सरलवाक्येषु शब्दरूपाणि धातुरूपाणि च प्रयोक्तुम्।	PO1, PO10	PSO1	**L3**
3. सरलसंस्कृतवाक्यानां रचनां बोधं च कर्तुम्।	PO2, PO10	PSO1, PSO3	**L3**
4. चयनितश्लोकानां पाठं अर्थबोधं च कर्तुम्।	PO1, PO12	PSO1	**L2**
5. दैनन्दिनसम्भाषणे प्राथमिकसंस्कृतशब्दभण्डारं व्याकरणं च प्रयोक्तुम्।	PO10, PO12	PSO3	**L3**

पाठ्यपुस्तकानि (Text Books):

1. प्रथमा दीपिका – संस्कृतभारती।

2. संस्कृतव्याकरणम् – कमलेशदत्तत्रिपाठी।

3. बालरामायणम् / बालभारतम्।

सन्दर्भपुस्तकानि (Reference Books):

1. टीच् युअरसेल्फ् संस्कृतम् – माइकल् कोल्सन्।

2. बृहत्संस्कृतव्याकरणम् – एम्.आर्. काले।

3. सुभाषितरत्नभाण्डागारम्।

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2									2			2		2
CO2	2									2			2		
CO3		2								2			2		2
CO4	2											2	2		
CO5										3		2			3
CO*	2.0	2.0								2.3		2.0	2.0		2.3

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT1202F	FRENCH	L	T	P	C
		3	0	0	3

Course Description:

This course introduces students to French by intensively studying important aspects of pronunciation, vocabulary, grammar and sentence formation through practice sets and audio visual lessons. It introduces the workings and sounds of the language and provides the necessary tools to enable students to make sentences from scratch.

Course Objectives:

1. To train the students to know about France, French culture and basics.
2. To teach them to learn basic grammar and vocabulary.
3. To train them to learn tenses in French.
4. To train them to talk about their daily routine.
5. To train them to converse in French in day-to-day scenarios.

Unit - I	**Introduction to France and its regions**	**9 Hrs**

French alphabets and numbers, countries and nationality; Grammaire - Verbs - s'appeler, être, avoir, definite and indefinite articles; Communication - Greetings, Self Introduction.

Unit - II	**Basic vocabulary, colours, months and days**	**9 Hrs**

Grammaire - Verbes - Conjugation: Present tense (ER, IR, RE ending verbs), Adjective possessive; Communication - Talk about family and friends, date, time etc.

Unit - III	**Hobbies, interests and daily routine**	**9 Hrs**

Grammaire - Irregular verbs, Reflexive verbs, Future proche; Communication - Talking about hobbies and interests.

Unit - IV	**Vocabulary of places and transport**	**9 Hrs**

Grammaire - Pertinent verbs, adjective demonstrative, past tense, prepositions; Communication - Narrating an incident or story.

Unit - V	**Vocabulary of food, services, money**	**9 Hrs**

Grammaire - Negation, Verbs - acheter, manger, payer, articles partitifs; Communication - Accept and refuse an invitation, situation in a restaurant.

Total Hours			**45 Hrs**
Course Outcomes	**POs**	**PSOs**	**Peak BTL**
CO1: Acquire familiarity in the French alphabet & basic vocabulary.	**PO10, PO12**	**PSO3**	**1**
CO2: Listen and identify individual sounds of French.	**PO10**	**PSO3**	**2**
CO3: Use basic sounds and words while speaking.	**PO10**	**PSO3**	**3**
CO4: Read and understand simple advertisements, brochures and invitations.	**PO10**	**PSO3**	**2**
CO5: Understand and use basic grammar and appropriate vocabulary in completing language tasks.	**PO9, PO10**	**PSO3**	**3**

Text Books:

1. Grammaire Progressive du Français, CLÉ International, 2010.

2. Saison 1, Marie-Noëlle Cocton et al, Didier, 2014.

3. Cosmopolite A1 - Nathalie Hirschsprung, Tony Tricot.

Reference Books:

1. Préparation à l'examen du DELF A1 - Hachette.

2. Réussir le DELF A1 - Bruno Girardeau.

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1										2		1			2
CO2										2					2
CO3										3					3
CO4										2					2
CO5									1	2					3
CO*									1.0	2.2		1.0			2.4

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT1202G	GERMAN	L	T	P	C
		3	0	0	3

Course Description: German Language Training.

Course Objectives:

1. Importance of German Language in Global perspective.
2. To develop Reading skills for Basic Level.
3. German writing skills, particularly emails & short messages.
4. To develop basic German Speaking skills in order to meet the general activities.
5. Listening practise to understand German accent of native German speakers.

Unit - I	Guten Tag!	9 Hrs

Saying hello and goodbye, introducing oneself and others, talking about oneself and others, numbers 1-20, spelling words and names, talking about countries and languages, the alphabet, first verbs in present tense, how to ask questions, useful terms and expressions.

Unit - II	Freunde, Kollegen und Ich	9 Hrs

Talking about hobbies, days of the week, numbers from 20 on up, months and seasons in the year, talking about work and job, definite article, personal pronouns, the verbs to have (haben) and to be (sein), plurals of nouns.

Unit - III	In der Stadt	9 Hrs

Getting around a town and asking for the way, giving directions, indefinite articles, negation with kein, imperative forms.

Unit - IV	Guten Appetit!	9 Hrs

Talking about food, planning a trip to the grocery store, food and meals and talking about it, verbs that require the accusative.

Unit - V	Tag für Tag	9 Hrs

Telling and understanding time, talking about one's family, possessive articles (mein, dein) and modal auxiliaries (müssen, können, wollen).

Total Hours	45 Hrs

Course Outcomes	POs	PSOs	Peak BTL
CO1: Basic Reading skills.	PO10	PSO3	2
CO2: Basic Writing skills with basic Grammar.	PO10, PO12	PSO3	3
CO3: Speaking skills and readiness to do an advanced German course.	PO10, PO12	PSO3	3
CO4: Understanding basic German for Daily Communication.	PO10	PSO3	2
CO5: Awareness of European Union and opportunities in Europe.	PO12	PSO3	2

Text Books:

1. A1-German Level - Netzwerk A1 Book - Prescribed by International Institute - Goethe Institute Delhi.

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1										2					2
CO2										2		1			2
CO3										3		1			3
CO4										2					2
CO5												2			2
CO*										2.3		1.3			2.2

Level: 3 - High, 2 - Moderate, 1 – Low

26TAUT1202H	SPANISH	L	T	P	C
		3	0	0	3

Course Description:

The course is designed for beginners in Spanish. It covers various aspects such as Listening, Speaking, Reading and Writing. It is designed for students to gain a basic understanding of the language, and communicate in day to day situations, such as making purchases in the market. The students will not only gain an understanding of the language, but also the cultural aspects and dynamics of Hispanic countries. No prior understanding of Spanish is required.

Course Objectives:

1. Understand and use common Spanish vocabulary and expressions.
2. Communicate in simple, everyday situations.
3. Ask and answer basic questions.
4. Develop basic writing skills.
5. Gain an introductory understanding of Spanish-speaking cultures.

Unit - I	Introduction to Spanish	9 Hrs

Introduction to Spanish language and culture; basic greetings, formal vs. informal language; the Spanish alphabet and pronunciation; short introductions to Spanish-speaking countries; basic sentence structures; subject pronouns (yo, tú, él/ella, nosotros, etc.); basic verbs "ser" and "estar"; introducing oneself and others.

Unit - II	Everyday Vocabulary and Simple Conversations	9 Hrs

Numbers, dates, and time; counting (1-100); telling time; days of the week, months, seasons; family, people, and professions; family members vocabulary; simple professions and occupations; basic question words (qué, dónde, cuándo, por qué).

Unit - III	Verb Conjugation - Present Tense	9 Hrs

Introduction to regular verbs in the present tense; conjugating -ar, -er, and -ir verbs (hablar, comer, vivir); practice with simple sentences; irregular verbs (tener, hacer, ir); using irregular verbs in the present tense; short role-plays and conversational practice.

Unit - IV	Describing People and Things	9 Hrs

Adjectives and agreement in gender and number; describing physical appearance and personality; common adjectives and their agreement (alto/alta, simpático/simpática); using "tener" for possession; expressing age, possessions and characteristics; combining "tener" with adjectives and nouns; introduction to past tense - pretérito indefinido and imperfecto.

Unit - V	Basic Daily Activities	9 Hrs

Reflexive verbs for daily routines (levantarse, ducharse, vestirse, etc.); talking about morning and evening routines; talking about hobbies and interests; verbs like gustar and encantar; expressing preferences and free-time activities; shopping and eating out; vocabulary for shopping (clothes, money, colors); asking for prices and quantities; using "querer" for shopping; dining out, ordering food, common food/restaurant vocabulary.

Total Hours	45 Hrs

Course Outcomes	POs	PSOs	Peak BTL
CO1: Understand and use common Spanish vocabulary and expressions.	**PO10, PO12**	**PSO3**	**2**
CO2: Communicate in simple, everyday situations.	**PO10**	**PSO3**	**3**
CO3: Ask and answer basic questions.	**PO10**	**PSO3**	**2**
CO4: Develop basic writing skills.	**PO10**	**PSO3**	**3**
CO5: Gain an introductory understanding of Spanish-speaking cultures.	**PO9, PO12**	**PSO3**	**2**

Text Books:

1. Easy Spanish Step-By-Step Book by Barbara Bregstein.
2. Spanish Grammar manual by Enrique Yepes.

Reference Books:

1. Teach Yourself Complete Spanish book by Juan Kattan-Ibarra.
2. Learning Spanish Course Workbook by Professor Bill Worden.

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1										**2**		**1**			**2**
CO2										**3**					**3**
CO3										**2**					**2**
CO4										**2**					**2**
CO5									**1**			**1**			**2**
CO*									**1.0**	**2.3**		**1.0**			**2.2**

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT1202I	JAPANESE	L	T	P	C
		3	0	0	3

Course Description:

This course introduces students to Japanese by intensively studying important aspects of pronunciation, vocabulary, grammar and sentence formation through practice sets and audio-visual lessons. It introduces the workings and sounds of the language and provides the necessary tools to enable students to make sentences from scratch.

Course Objectives:

1. To train the students to learn basic Japanese.
2. To teach them to learn basic grammar and vocabulary.
3. To train them to converse in Japanese in day-to-day scenarios.
4. To train students to get familiar with travel vocabulary and sentences.
5. To teach them to understand Japanese food culture and other services.

Unit - I	Introduction to Japanese	9 Hrs

Introduction to Japanese, Japanese script types and its significance, simple greetings, self-introduction in Japanese, basic vocabulary to communicate in classroom, food, times of the day, vocabulary of common words used in daily life, listening & speaking practice.

Unit - II	Hiragana and Basic Sentence Structure	9 Hrs

Hiragana (あ-ん) introduction and writing practice using strokes, vocabulary of places, days of the week, telling time, basic sentence structure: Subject-Object-Verb (SOV), time expressions, usage in sentences, asking & answering simple questions, introducing others & nationalities, culture: Japanese names & addressing people.

Unit - III	Katakana and Conversations	9 Hrs

Katakana (ア-ン) introduction and writing practice using strokes, vocabulary of family members, numbers, money, time expressions, common verbs, sentence formation with particles は, の, か, basic conversations at restaurant, shopping phrases & asking prices, role-play: describing daily activities, culture: Japanese food & restaurant etiquette.

Unit - IV	Kanji and Polite Requests	9 Hrs

Introduction to Kanji, basic kanji writing and identification, vocabulary for locations and adjectives, making polite requests, using adjectives in sentences, basic conversations at a railway station, asking and giving directions, mini dialogue practice, culture: Japanese transport system.

Unit - V	Preferences and Plans	9 Hrs

Vocabulary of expressing likes & dislikes, vocabulary used in school/university, talking about plans, making invitations, basic conversations at school/university, role-play: planning a weekend outing, culture: Japanese festivals and traditions.

Total Hours			45 Hrs
Course Outcomes	**POs**	**PSOs**	**Peak BTL**
CO1: Read and write basic Japanese: recognize and write Hiragana, Katakana, and around 20-30 basic Kanji.	PO10, PO12	PSO3	1

CO2: Communicate in simple Japanese: introduce themselves, ask and answer basic questions, and hold short conversations on daily topics.	**PO10**	**PSO3**	**3**
CO3: Understand basic grammar and sentence structure: form simple sentences using common verbs, adjectives, and particles correctly.	**PO10**	**PSO3**	**2**
CO4: Comprehend spoken Japanese: understand slow, clear speech in common daily situations (e.g., greetings, directions, shopping).	**PO10**	**PSO3**	**2**
CO5: Gain cultural awareness: understand fundamental aspects of Japanese etiquette, customs, and traditions, including greetings and addressing people.	**PO9, PO12**	**PSO3**	**2**

Text Books:

1. Minna No Nihongo Textbook-1, 2nd Edition, 3A Corporation, 2012.
2. Minna No Nihongo Shokyu-1 Translation and Grammar, 2nd Edition, 3A Corporation, 2012.
3. Minna No Nihongo Textbook-2, 2nd Edition, 3A Corporation, 2012.

Reference Books:

1. The preparatory course for the Japanese Language Test - UNICOM Inc.
2. New Complete Master Grammar JLPT N3, 3A Corporation, 2012.

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1										2		1			2
CO2										3					3
CO3										2					2
CO4										2					2
CO5									1			2			3
CO*									1.0	2.3		1.5			2.4

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT1202J	KOREAN	L	T	P	C
		3	0	0	3

Course Description:

This course is a foundational course for learners studying Korean for the first time. Students learn to read and write Hangul, basic vocabulary and grammar, and everyday conversational Korean, while gaining an understanding of Korean culture and etiquette.

Course Objectives:

1. To read and write the consonants and vowels of Hangul.
2. To understand and use basic vocabulary and sentences.
3. To carry out simple everyday communication.
4. To read and write short texts using basic grammar.
5. To understand Korean culture and etiquette.

Unit - I	**Introduction to Korea and Hangul**	**9 Hrs**

Introduction to Korea, Hangul (consonants and vowels), pronunciation, greetings, classroom expressions. Activities: speaking, reading, writing and role-play.

Unit - II	**Self and Family Introduction**	**9 Hrs**

Self-introduction, family introduction, numbers, dates and time, basic sentences. Activities: speaking, reading, writing and role-play.

Unit - III	**Daily Life Conversations**	**9 Hrs**

Food, shopping, transportation, asking for directions, everyday conversation. Activities: speaking, reading, writing and role-play.

Unit - IV	**Basic Grammar and Skills**	**9 Hrs**

Basic grammar, reading, writing, listening, usage of adjectives and verbs. Activities: speaking, reading, writing and role-play.

Unit - V	**Korean Culture and Etiquette**	**9 Hrs**

Korean culture and etiquette, holidays, traditional food, role-play, comprehensive review. Activities: speaking, reading, writing and role-play.

Total Hours	**45 Hrs**

Course Outcomes:	**POs**	**PSOs**	**BTL**
1. Read and write Hangul accurately.	PO1	PSO1	**3**
2. Use basic Korean expressions.	PO10		**3**
3. Carry out simple everyday conversations.	PO9, PO10	PSO3	**3**
4. Read and write short sentences.	PO1, PO10		**3**

5. Understand and practise Korean culture and etiquette.	PO6, PO12	PSO3	**2**

Text Books:

1. Sejong Korean 1 (King Sejong Institute).
2. Integrated Korean Beginning 1.
3. Korean Made Simple 1.

Reference Books:

1. Talk To Me In Korean Level 1.
2. Korean Grammar in Use: Beginning.
3. Elementary Korean.

Web Links (Online Source):

1. https://www.sejonghakdang.org
2. https://www.topik.go.kr
3. https://talktomeinkorean.com
4. https://www.howtostudykorean.com

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**2**									**2**			**2**		**2**
CO2	**2**									**2**			**2**		
CO3		**2**								**2**			**2**		**2**
CO4	**2**											**2**	**2**		
CO5										**3**		**2**			**3**
CO*	**2.0**	**2.0**								**2.3**		**2.0**	**2.0**		**2.3**

Level: 3 - High, 2 - Moderate, 1 – Low

26TAUT1202J	한국어 기초 (Korean)	L	T	P	C
		3	0	0	3

교과목 개요(Course Description)

본 교과목은 한국어를 처음 배우는 학습자를 위한 기초 과정이다. 학생들은 한글 읽기와 쓰기, 기본 어휘와 문법, 일상생활에서 사용하는 기초 회화를 학습하며 한국 문화와 예절을 이해한다.

교과목 목표(Course Objectives)

1. 한글의 자음과 모음을 읽고 쓸 수 있다.
2. 기초 어휘와 문장을 이해하고 사용할 수 있다.
3. 일상생활에서 간단한 의사소통을 할 수 있다.
4. 기초 문법을 활용하여 짧은 글을 읽고 쓸 수 있다.
5. 한국 문화와 예절을 이해한다.

제1단원		**9시간**
대한민국 소개, 한글(자음·모음), 발음, 인사말, 교실 표현 활동: 말하기, 읽기, 쓰기 및 역할극 활동.		
제2단원		**9시간**
자기소개, 가족 소개, 숫자, 날짜와 시간, 기본 문장 활동: 말하기, 읽기, 쓰기 및 역할극 활동.		
제3단원		**9시간**
음식, 쇼핑, 교통, 길 묻기, 일상 회화 활동: 말하기, 읽기, 쓰기 및 역할극 활동.		
제4단원		**9시간**
기초 문법, 읽기, 쓰기, 듣기, 형용사와 동사 활용 활동: 말하기, 읽기, 쓰기 및 역할극 활동.		
제5단원		**9시간**
한국 문화와 예절, 명절, 전통음식, 역할극, 종합 복습 활동: 말하기, 읽기, 쓰기 및 역할극 활동.		
총 시간 (Total Hours)		**45시간**

학습 성과 (Course Outcomes)	**POs**	**PSOs**	**Peak BTL**

1. 한글을 정확하게 읽고 쓸 수 있다.	PO1, PO10	PSO1, PSO3	**L3**
2. 기초 한국어 표현을 사용할 수 있다.	PO1, PO10	PSO1	**L3**
3. 간단한 일상 대화를 수행할 수 있다.	PO2, PO10	PSO1, PSO3	**L3**
4. 짧은 문장을 읽고 작성할 수 있다.	PO1, PO12	PSO1	**L2**
5. 한국 문화와 예절을 이해하고 실천할 수 있다.	PO10, PO12	PSO3	**L3**

교재(Text Books)

1. 세종한국어 1 (King Sejong Institute)
2. Integrated Korean Beginning 1
3. Korean Made Simple 1

참고도서(Reference Books)

1. Talk To Me In Korean Level 1
2. Korean Grammar in Use: Beginning
3. Elementary Korean

온라인 자료 (Online Source)

1. https://www.sejonghakdang.org
2. https://www.topik.go.kr
3. https://talktomeinkorean.com
4. https://www.howtostudykorean.com

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**2**									**2**			**2**		**2**
CO2	**2**									**2**			**2**		
CO3		**2**								**2**			**2**		**2**
CO4	**2**											**2**	**2**		
CO5										**3**		**2**			**3**
CO*	**2.0**	**2.0**								**2.3**		**2.0**	**2.0**		**2.3**

Level: 3 - High, 2 - Moderate, 1 - Low

Semester – III

26SOTT2701	Number Theory and Discrete Structures (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		3	0	0	3

Prerequisite: Probability and Statistics

Course Description:

This course introduces fundamental concepts of Number Theory, Mathematical Logic, Set Theory, and Algebraic Structures. It develops skills in modular arithmetic, logical reasoning, relations, functions, and group theory. The course also covers combinatorial counting techniques, permutations, combinations, and inclusion-exclusion principles. Students learn methods for solving recurrence relations using generating functions and characteristic roots. Overall, the course provides a strong mathematical foundation for computer science, discrete mathematics, and advanced theoretical studies.

Course Objectives:

1. To understand the fundamental concepts of Number Theory, divisibility, congruences, and modular arithmetic.
2. To develop logical reasoning skills through the study of propositional and predicate logic, normal forms, and inference techniques.
3. To analyze sets, relations, functions, lattices, and algebraic structures such as semigroups, monoids, and groups.
4. To apply combinatorial methods for counting, permutations, combinations, and solving enumeration problems.
5. To formulate and solve recurrence relations using generating functions, substitution methods, and characteristic root techniques.

Unit - I	Number Theory and Modular Arithmetic	9 Hrs

The Well-Ordering Property, Divisibility, Greatest Common Divisors, The Euclidean Algorithm, The Fundamental Theorem of Arithmetic, Introduction to Congruences, Linear Congruences, The Chinese Remainder Theorem, Wilson's Theorem and Fermat's Little Theorem, Euler's Theorem, Euler's Phi-Function, The Sum and Number of Divisors.

Unit - II	Mathematical Logic	9 Hrs

Introduction, Statements and Notation, Connectives, Well-Formed Formulas, Tautology, Duality Law, Equivalence, Implication, Normal Forms, Functionally Complete Set of Connectives, Inference Theory of Statement Calculus, Predicate Calculus, Inference Theory of Predicate Calculus.

Unit - III	Set Theory	9 Hrs

Basic Concepts of Set Theory, Relations and Ordering, Functions, Composition of Functions, Inverse Functions, Lattices and their Properties. Algebraic Structures: Algebraic Systems – Examples and General Properties, Semigroups and Monoids, Groups, Subgroups, Homomorphism, Isomorphism.

Unit - IV	Elementary Combinatorics	9 Hrs

Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems, The Principle of Inclusion-Exclusion.

Unit - V	Recurrence Relations	9 Hrs

Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, The Method of Characteristic Roots, Solutions of Inhomogeneous Recurrence Relations.

Total Hours	45 Hrs

Course Outcomes:	POs	PSOs	Peak BTL

1. Apply principles of number theory, divisibility, congruences, and modular arithmetic to solve mathematical problems.	PO1, PO2	**1**	**3**
2. Analyze and construct logical arguments using propositional logic, predicate logic, and inference rules.	PO1, PO2	**1**	**4**
3. Demonstrate understanding of set theory, relations, functions, lattices, and algebraic structures, and perform related operations and proofs.	PO1, PO2	**1**	**3**
4. Solve counting and enumeration problems using permutations, combinations, binomial theorems, and the principle of inclusion-exclusion.	PO1, PO2	**1**	**3**
5. Formulate and solve recurrence relations using generating functions, characteristic roots, and other standard techniques.	PO1, PO2, PO5	**1,2**	**5**

Text Books:

1. Joe L. Mott, Abraham Kandel and Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2/e, Pearson, 2008. (For Units III to IV).
2. J. P. Trembly and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, 1/e, McGraw Hill, 2017. (For Unit II & V).
3. Kenneth H. Rosen, Elementary Number Theory and its Applications, AT&T Information Systems & Bell Laboratories. (Unit I).

Reference Books:

1. Ralph P. Grimaldi and B.V. Ramana, Discrete and Combinatorial Mathematics, an Applied Introduction, 5/e, Pearson, 2016.
2. Narsingh Deo, Graph Theory with Applications to Engineering, Prentice Hall, 1979.
3. D.S. Malik and M.K. Sen, Discrete Mathematics: Theory and Applications, 1/e, Cengage Learning, 2012.
4. Herbert S. Zuckerman, Hugh L. Montgomery and Ivan Niven, An Introduction to the Theory of Numbers, Wiley Publishers.

Web Links (Online Source):

3. https://onlinecourses.nptel.ac.in/noc23_cs22/preview
4. https://www.slideshare.net/ItishreeDash3/a-study-on-number-theory-and-its-applications

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**2**											**2**		
CO2	**3**	**3**											**2**		
CO3	**3**	**3**											**2**		
CO4	**3**	**2**											**2**		
CO5	**3**	**3**			**2**								**3**		
CO*	**3.0**	**2.6**			**2.0**								**2.2**		

Level: 3 – High, 2 – Moderate, 1 – Low

26SOTT2301	**Design and Analysis of Algorithms** **(Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

Prerequisite: Data Structures; Programming for Problem Solving Using C.

Course Description:

Design and analysis of algorithms is the process of finding the computational complexity of algorithms. It helps to design and analyse the logic on how the algorithm will work before developing the actual code for a program. It focuses on introduction to algorithms, asymptotic complexity, sorting and searching using divide and conquer, greedy method, dynamic programming, backtracking, branch and bound, and NP-hard and NP-complete problems. The applications of algorithm design are used for information storage, retrieval, transportation through networks, and presentation to users.

Course Objectives:

1. To analyse the asymptotic performance of algorithms.
2. To apply important algorithmic design paradigms and methods of analysis.
3. To synthesize efficient algorithms in common engineering design situations.
4. To use methods and techniques for analysing the correctness and resource requirements of algorithms.
5. To familiarize the concepts of deterministic and non-deterministic algorithms.

Unit - I	**Introduction**	**12 Hrs**

Algorithm – Pseudo Code for Expressing Algorithms – Performance Analysis – Space Complexity – Time Complexity – Asymptotic Notation – Big Oh Notation – Omega Notation – Theta Notation and Little Oh Notation – Recurrences: Substitution Method, Recursion-Tree Method, Master Method. Disjoint Sets: Disjoint Set Operations – Union and Find Algorithms.

Unit - II	**Divide and Conquer & Greedy Method**	**12 Hrs**

Divide and Conquer: General Method – Applications – Binary Search – Quick Sort – Merge Sort – Strassen's Matrix Multiplication. Greedy Method: General Method – Applications – Knapsack Problem – Job Sequencing with Deadlines – Minimum Cost Spanning Trees – Optimal Storage on Tapes – Single Source Shortest Path Problem.

Unit - III	**Dynamic Programming**	**12 Hrs**

General Method – Multistage Graphs – 0/1 Knapsack Problem – All Pairs Shortest Path Problem – Travelling Salesperson Problem – Optimal Binary Search Tree.

Unit - IV	**Backtracking**	**12 Hrs**

General Method – Applications – N-Queens Problem – Sum of Subsets Problem – Graph Colouring – Hamiltonian Cycles – Knapsack Problem – Rat in a Maze.

Unit - V	**Branch and Bound, NP-Hard and NP-Complete Problems**	**12 Hrs**

Branch and Bound: General Method – Applications – Travelling Salesperson Problem – 0/1 Knapsack Problem – LC Branch and Bound Solution – FIFO Branch and Bound Solution. NP-Hard and NP-Complete Problems: Basic Concepts – Non-deterministic Algorithms – NP-Hard and NP-Complete Classes – Cook's Theorem.

Total Hours	**60 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Gain knowledge of time complexity, space complexity and recurrence methods.	PO1, PO2, PO3	**1**	**2**
2. Analyze the given problem and identify appropriate algorithm design technique for problem solving.	PO1, PO2, PO3, PO4	**1,3**	**4**

3. Apply the Dynamic Programming design technique for problem solving.	PO1, PO2, PO3, PO4	**1,3**	**3**
4. Apply the backtracking design technique for problem solving.	PO1, PO2, PO3, PO4	**1,3**	**3**
5. Analyze branch and bound algorithms for solving complex problems and prove that a given problem is NP-Complete.	PO1, PO2, PO3, PO4	**1,2,3**	**4**

Text Books:

1. Introduction to Automata Theory, Languages, and Computation, Hopcroft H.E. and Ullman Jeffrey D., 3/e, 2006, Pearson Education, New Delhi, India.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, The Design and Analysis of Computer Algorithms, Pearson India, 1/e, 2013.

Reference Books:

1. Knuth Donald E, Art of Computer Programming: Fundamental Algorithms Volume 1 - Fundamental Algorithms, 3/e, Pearson Publishers, 2011.
2. Levitin A, Introduction to the Design and Analysis of Algorithms, Pearson Education, 3/e, 2012.
3. Thomas H. Cormen, C.E. Leiserson, R L. Rivest and C. Stein, Introduction to Algorithms, 3/e, MIT Press, 2009.
4. Jon Kleinberg and Éva Tardos, Algorithm Design, Pearson Education, 2014.

Web Links (Online Source):

1. https://nptel.ac.in/courses/106106131
2. https://market.tutorialspoint.com/course/design-and-analysis-of-an-algorithm/index.asp

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**3**	**3**										**3**		
CO2	**2**	**3**	**3**	**2**									**3**		**2**
CO3	**2**	**3**	**3**	**2**									**3**		**2**
CO4	**2**	**3**	**3**	**2**									**3**		**2**
CO5	**2**	**3**	**3**	**2**									**3**	**1**	**2**
CO*	**2.2**	**3.0**	**3.0**	**2.0**									**3.0**	**1.0**	**2.0**

Level: 3 – High, 2 – Moderate, 1 - Low

26SOTT2302	Object-Oriented Programming through Java (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		3	0	0	3

Prerequisite: NIL.

Course Description:

This course introduces the principles of Object-Oriented Programming (OOP) using Java, one of the most widely used programming languages for enterprise, mobile, cloud, and web application development. The course covers Java programming fundamentals, object-oriented concepts, exception handling, multithreading, collections, file handling, graphical user interfaces, and database connectivity. Students gain hands-on experience in designing, implementing, and debugging Java applications while learning industry-standard programming practices. The laboratory component reinforces theoretical concepts through practical programming assignments and mini-projects.

Course Objectives:

Upon successful completion of this course, students will be able to:

1. Understand Java programming fundamentals and develop programs using basic language constructs.
2. Apply object-oriented programming principles including classes, inheritance, polymorphism, abstraction, and encapsulation.
3. Develop robust Java applications using exception handling, multithreading, and collection framework.
4. Build event-driven applications using Java GUI programming and perform file handling and database connectivity.
5. Design and implement real-world object-oriented software solutions following best programming practices.

Unit - I	Introduction to Programming	10 Hrs

Introduction to Object-Oriented Programming - Features of Java - Java Architecture -Java Virtual Machine (JVM) -Java Runtime Environment (JRE) -Java Development Kit (JDK) -Installing Java Development Environment -Structure of Java Program -Tokens, Keywords, Identifiers -Variables and Data Types -Operators and Expressions -Input and Output -Command-line Arguments -Decision Making Statements -Looping Statements -Arrays (One-dimensional and Multidimensional) -Strings and String Manipulation -Wrapper Classes -Type Casting.

Case Studies: Student Grade Management System and Banking Interest Calculator.

Unit - II	Object-Oriented Programming Concepts	9 Hrs

Classes and Objects -Constructors -Constructor Overloading -Method Overloading -Static Members -Access Specifiers -Encapsulation -Packages -Inheritance -Types of Inheritance -Method Overriding -Dynamic Method Dispatch -Polymorphism -Abstract Classes -Interfaces -Nested Classes -Inner Classes -Anonymous Classes -Enumerations -Object Class -Final Keyword.

Unit - III	Advanced Java Programming	9 Hrs

Exception Handling -Try-Catch-Finally -Throw and Throws -User-defined Exceptions -Assertions -Multithreading -Thread Life Cycle -Creating Threads -Thread Synchronization -Inter-thread Communication.

Java Collections Framework -List -Set -Queue -Map -Iterators Comparable and Comparator -Generics -Lambda Expressions -Functional Interfaces -Stream API -Date and Time API.

Case Studies: Online Ticket Booking System and Employee Payroll Processing.

Unit - IV	Java I/O and Database Connectivity	8 Hrs

Java I/O Streams -File Handling -Buffered Streams -Serialization -Object Streams.

JDBC Architecture -JDBC Drivers -Database Connectivity -Prepared Statements -ResultSet -Transactions -CRUD Operations.

Case Studies: Student Information Management System and Hotel Reservation System

Unit - V	Modern Java Programming and Applications	9 Hrs

Introduction to Reflection API -Introduction to Annotations -Introduction to Java Modules.
Introduction to Maven -Unit Testing using JUnit -Logging -Java Documentation (JavaDoc) -Coding Standards -Design Principles.
Emerging Trends in Java -Java in Cloud Applications -Java in Enterprise Computing.
Case Studies: Chat Application using Socket Programming and Enterprise Inventory Management System

Total Hours			**45 Hrs**
Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Analyze proficiency in Java programming syntax, control structures, and object-oriented programming concepts.	PO1, PO2, PO3,PO12	**1,2,3**	**3**
2. Apply modular software solutions using classes, inheritance, interfaces, and polymorphism.	PO1, PO2, PO3, PO4, PO5, P12	**1,2,3**	**4**
3. Design reliable applications utilizing exception handling, collections, generics, and multithreading.	PO1, PO2, PO3, PO4, PO5, P12	**1,2,3**	**5**
4. Create GUI-based applications with file processing and database connectivity using JDBC.	PO1, PO2, PO3, PO4, PO5, P12	**1,2,3**	**6**
5. Develop complete Java applications by integrating object-oriented design principles with modern Java programming features.	PO1, PO2, PO3, PO4, PO5, P12	**1,2,3**	**6**

Text Books:

1. Java: The Complete Reference, Herbert Schildt, McGraw-Hill Education, 12th Edition, 2022 ISBN: 978-1265058430.
2. Core Java: Fundamentals, Cay S. Horstmann, Pearson, 13th Edition, 2024, ISBN: 978-0137872716
3. Head First Java, Kathy Sierra, Bert Bates, and Trisha Gee, O'Reilly Media, 3rd Edition, 2022 ISBN: 978-1491910779.

Reference Books:

1. Java How to Program, Paul Deitel and Harvey Deitel, Pearson, 12th Edition, 2021. ISBN: 978-0134743354.
2. Effective Java, Joshua Bloch, Addison-Wesley Professional, 3rd Edition, 2018. ISBN: 978-0134685999.
3. Java Performance, Scott Oaks, O'Reilly Media, 2nd Edition, 2020. ISBN: 978-1492056117.
4. Beginning Programming with Java for Dummies, Barry Burd, Wiley, 6th Edition, 2023. ISBN: 978-1394183386.
5. Java Concurrency in Practice, Brian Goetz, Tim Peierls, Joshua Bloch, Joseph Bowbeer, David Holmes, and Doug Lea, Addison-Wesley Professional, 1st Edition, 2006. ISBN: 978-0321349606.
6. Modern Java in Action, Raoul-Gabriel Urma, Mario Fusco, and Alan Mycroft, Manning Publications, 2nd Edition, 2022. ISBN: 978-1617293564.
7. Thinking in Java, Bruce Eckel, Prentice Hall, 4th Edition, 2006. ISBN: 978-0131872484.

Web Links (Online Source):

1. Oracle Java Documentation - https://docs.oracle.com/en/java/

2. The Java™ Tutorials (Oracle Archive) - https://docs.oracle.com/javase/tutorial/
3. OpenJDK Project - https://openjdk.org/

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	2	-	-	-	-	-	-	2	3	1	1
CO2	3	3	3	1	2	-	-	-	-	-	-	2	3	2	1
CO3	3	3	3	2	3	-	-	-	-	-	-	2	3	2	2
CO4	2	3	3	2	3	-	-	-	-	-	-	2	3	1	2
CO5	3	3	3	2	3	-	-	-	-	-	-	3	3	2	3
CO*	2.8	2.8	2.6	1.4	2.6							2.2	3.0	1.6	1.8

26SOTT2801	**Digital Logic Design**	L	T	P	C
	(Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	3	0	0	3

Prerequisite: Basic Electrical and Electronics Engineering.

Course Description:

Foundation in design and analysis of the operation of digital gates. Design and implementation of combinational and sequential logic circuits. Concepts of Boolean algebra, Karnaugh maps, flip-flops, registers, and counters and Verilog HDL programming for digital circuits.

Course Objectives:

1. To provide an introduction to logic design and the basic building blocks used in digital systems.
2. To understand number systems and codes, Boolean algebra, and logic gates.
3. To minimize logical functions using Boolean algebra, K-maps and the tabular method, and to understand combinational circuits.
4. To understand different sequential circuits and different arithmetic circuits.
5. To understand Verilog HDL programming for digital circuits.

Unit - I	**Number Systems**	**8 Hrs**

Overview of Number Systems, Complement Representation of Negative Numbers: Signed Magnitude, One's Complement Method, Two's Complement Method, Binary Addition and Subtraction. Digital Logic Gates, Boolean Algebra, De-Morgan's Theorem.

Unit - II	**Logic Simplification and Combinational Logic Design**	**10 Hrs**

Simplification of Boolean Functions using Boolean Algebra, SOP & POS Forms, Canonical Forms, Karnaugh Maps up to 5 Variables, Realization of Boolean Functions using Basic Gates, Code Conversion (Binary to Gray and vice versa, BCD to Excess-3, 8-4-2-1 to BCD).

Unit - III	**Combinational Logic Design**	**9 Hrs**

Analysis of Combinational Circuits, Design Procedure – Half/Full Adders/Subtractors, n-bit Adders/Subtractors, Binary Comparators, Decoder/Encoder, Multiplexer/De-Multiplexer.

Unit - IV	**Sequential Circuits**	**10 Hrs**

Concept of Latches, SR Flip-Flop, JK Flip-Flop, D Flip-Flop, T Flip-Flop, Master Slave JK Flip-Flop, Characteristic Equations, Conversion of Flip-Flops. Shift Registers, Design of Counters: Asynchronous Counters using T Flip-Flop, Synchronous Counters using D Flip-Flop and T Flip-Flop.

Unit - V	**Introduction to Verilog HDL**	**8 Hrs**

HDL Design Flow, Data Types, Gate-Level Modeling, Dataflow Modeling, Behavioral Modeling, Always Block and Initial Block, Blocking (=) vs Non-blocking (<=), if, case, Loops, Design Examples for Combinational and Sequential Circuits.

Total Hours	**45 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Understand the significance of number systems, conversions, and binary codes.	PO1, PO2, PO6, PO8, PO9, PO10	**1,2**	**2**
2. Apply different simplification methods for minimizing Boolean functions.	PO1, PO2, PO6, PO8, PO9, PO10	**1,2**	**3**

3. Illustrate knowledge on the design of various combinational circuits.	PO1, PO2, PO3, PO8, PO9, PO10	**1,2,3**	**3**
4. Illustrate the concept of sequential logic design and analyze the operation of flip-flops, registers, and counters.	PO1, PO2, PO3, PO4, PO9, PO10	**1,2,3**	**4**
5. Discuss the use of HDL and appropriate EDA tools for digital logic design and simulation.	PO1, PO2, PO6, PO8, PO9, PO10	**1,2**	**3**

Text Books:

1. M. Morris Mano and Michael D. Ciletti, Digital Design, 4/e, Pearson Education, 2013.
2. D.V. Hall, Digital Circuits and Systems, Tata McGraw Hill, 1989.

Reference Books:

1. igAnand Kumar, Switching Theory and Logic Design, 2/e, PHI, 2014.
2. Charles Roth, Digital System Design using Verilog HDL, Tata McGraw Hill, 2/e, 2012.
3. R.P. Jain, Modern Digital Electronics, Tata McGraw Hill, 4/e, 2009.
4. Donald D. Givone, Digital Principles and Design, McGraw Hill, 2002.

Web Links (Online Source):

3. https://nptel.ac.in/courses/117105080
4. https://nptel.ac.in/courses/106103358

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**2**	**3**				**2**		**2**	**3**	**2**			**2**	**2**	
CO2	**3**	**2**				**2**		**2**	**3**	**2**			**2**	**2**	
CO3	**2**	**3**	**2**					**2**	**2**	**2**			**2**	**2**	**2**
CO4	**3**	**2**	**2**	**2**					**2**	**2**			**2**	**2**	**2**
CO5	**2**	**3**				**2**		**2**	**3**	**2**			**2**	**2**	
CO*	**2.4**	**2.6**	**2.0**	**2.0**		**2.0**		**2.0**	**2.6**	**2.0**			**2.0**	**2.0**	**2.0**

Level: 3 – High, 2 – Moderate, 1 - Low

26TAUT2101	Health and Wellness (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		3	0	0	3

Prerequisite: Nil.

Course Description:

This course is designed to help students learn more about human health. It helps students understand how current health knowledge can be applied to make future human beings even stronger and healthier.

Course Objectives:

1. To help students understand the importance of a healthy lifestyle.
2. To familiarize students with physical and mental health.
3. To create awareness of various lifestyle-related diseases.
4. To understand the multiple dimensions of health and wellness, including physical, mental, emotional, social, and environmental aspects.
5. To equip students with the knowledge and skills to develop, implement, and maintain healthy lifestyle practices.

Unit - I	Foundations of Health and Genetics	9 Hrs

Define and Differentiate Health and Wellness, Importance of Health and Wellness, Basic Concepts of Genetics including Genes, DNA, Chromosomes and Inheritance Patterns; Genetic Factors Affecting Macronutrient (Carbohydrates, Proteins and Fats) Digestion; Genetic Variations Associated with Micronutrient (Vitamins and Minerals) Digestion; Malnutrition, Under-nutrition and Over-nutrition.

Unit - II	Overview of Body Systems	9 Hrs

Brief Overview of Body Systems: Skeletal System, Muscular System, Circulatory System, Lymphatic System, Cardiovascular System, Respiratory System, Nervous System (Central Nervous System, Peripheral Nervous System, Somatic and Autonomic Nervous Systems), Digestive System, Urinary System, Endocrine System, Reproductive System, Integumentary System.

Unit - III	Lifestyle, Mental Health and Vital Signs	9 Hrs

Sedentary Lifestyle and its Risk of Disease, Lifestyle Disease and its Management; Factors Affecting Mental Health: Stress, Anxiety and Depression; Identification of Suicidal Tendencies; Substance Abuse (Drugs, Cigarette, Alcohol), De-addiction, Counselling and Rehabilitation. Four Vital Signs: Pulse Rate, Respiratory Rate, Blood Pressure, Body Temperature; Other Measurements: Body Mass Index, Waist-Hip Ratio, Basal Metabolic Rate.

Unit - IV	Risk Factors and Management of Common Diseases	9 Hrs

Risk Factors and Pathology of the Following Diseases and their Management: Diabetes, Hypertension, Coronary Heart Disease, Obesity, Osteoporosis, Osteoarthritis, Rheumatoid Arthritis, Cancers (Blood, Breast, Brain, Lung, Liver and Kidney), Polycystic Ovarian Syndrome (PCOS), Pain (including Low Back Pain).

Unit - V	Functional Foods and Yoga	9 Hrs

Introduction to Functional Foods; Nutrients and Bioactive Compounds in Functional Foods; Functional Foods for Cardiovascular Health, Weight Management, Immune Function, Cognitive Health and Chronic Disease Prevention; Yoga and its Importance in Health and Wellness.

Total Hours	45 Hrs

Course Outcomes:	POs	PSOs	Peak BTL
1. Understand the relationship between fitness and wellness.	PO1, PO12	1	2
2. Explain the various dimensions of wellbeing and their practical	PO1,	1	2

implications.	PO12		
3. Apply behavior change theories and strategies to promote healthy habits such as exercise, stress management and nutrition.	PO1, PO2, PO9	**1,2**	**3**
4. Develop realistic health goals and wellness plans, and identify strategies to overcome barriers to maintaining a healthy lifestyle.	PO1, PO2, PO12	**1,2**	**3**
5. Describe the principles of a balanced diet, physical activity, mental health management, social relationships and environmental factors that influence health.	PO1, PO6, PO12	**1,2**	**2**

Text Books:

1. Claude Bouchard, Steven N. Blair and William L. Haskell, Physical Activity and Health.
2. Emily Attached and Marzia Fernandez, Mental Health Workbook, 2021.
3. Nashay Lorick, Mental Health Workbook for Women: Exercises to Transform Negative Thoughts and Improve Wellbeing, 2022.

Reference Books:

1. C. Nyambichu and Jeff Lumiri, Lifestyle Diseases: Lifestyle Disease Management, 2018.
2. Angela Clow and Sarah Edmunds, Physical Activity and Mental Health, 2013.

Web Links (Online Source):

1. https://nptel.ac.in/courses/110101165
2. https://nptel.ac.in/courses/109106406

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**2**											**1**		**1**	
CO2	**2**											**1**		**1**	
CO3	**2**	**1**							**1**					**2**	
CO4	**2**	**2**										**2**		**2**	
CO5	**2**					**2**						**1**		**2**	
CO*	**2.0**	**1.5**				**2.0**			**1.0**			**1.2**		**1.6**	

Level: 3 – High, 2 – Moderate, 1 - Low

26SOTT2901	Constitution of India (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		3	0	0	0

Prerequisite: Nil.

Course Description:

The Constitution of India course provides a comprehensive understanding of the fundamental principles, structure, and functioning of the Indian Constitution. This course examines the historical evolution, key features, and various interpretations of the Constitution, highlighting its significance in shaping India's legal and political landscape. Through this course, students will gain insights into the roles and responsibilities of different branches of government, fundamental rights and duties of citizens, and the constitutional mechanisms that ensure the democratic functioning of the nation.

Course Objectives:

1. To realize the significance of the Constitution of India to students from all walks of life and help them understand its basic concepts.
2. To identify the importance of fundamental rights as well as fundamental duties.
3. To understand the functioning of Union, State and Local Governments in the Indian federal system.
4. To learn the procedure and effects of emergency provisions, the composition and activities of the Election Commission, and the amendment procedure.
5. To acquire knowledge to appear for competitive examinations.

Unit - I	**Historical Background and Philosophical Foundations**	**9 Hrs**

Historical Background – Constituent Assembly of India – Philosophical Foundations of the Indian Constitution – Preamble – Constitutional Amendments.

Unit - II	**Fundamental Rights, Duties and Directive Principles**	**9 Hrs**

Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for Citizens.

Unit - III	**Union Government**	**9 Hrs**

Union Government – Structure of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.

Unit - IV	**State Government**	**9 Hrs**

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and Other Subordinate Courts.

Unit - V	**Statutory Institutions and Local Self Government**	**9 Hrs**

Statutory Institutions – Elections – Election Commission of India, National Human Rights Commission, National Commission for Women; Local Self Government; Lokpal.

Total Hours	**45 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Understand and explain the significance of the Indian Constitution as the fundamental law of the land.	PO1, PO6, PO12	**2**	**2**
2. Exercise fundamental rights responsibly while identifying one's responsibilities in nation-building.	PO6, PO8, PO12	**2**	**3**
3. Analyze the Indian political system and the powers and functions of the Union, State and Local Governments.	PO1, PO2, PO6	**2**	**4**

4. Understand the electoral process, emergency provisions and amendment procedure.	PO1, PO6, PO12	**1**	**2**
5. Apply constitutional knowledge to competitive examination contexts with confidence.	PO1, PO12	**1**	**3**

Text Books:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India, New Delhi.
2. R. C. Agarwal, Indian Political System, S. Chand and Company, New Delhi, 1997.

Reference Books:

1. Brij Kishore Sharma, Introduction to the Constitution of India, Prentice Hall of India, New Delhi.
2. National Council of Educational Research and Training (NCERT), Indian Constitution at Work, Sri Aurobindo Marg, New Delhi.

Web Links (Online Source):

1. https://cdnbbsr.s3waas.gov.in/s380537a945c7aaa788ccfcdf1b99b5d8f/uploads/2023/05/2023050195.pdf
2. https://legislative.gov.in/constitution-of-india/

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2					2						1		2	
CO2						3		2				1		2	
CO3	2	2				2								2	
CO4	2					1						1		1	
CO5	2											2		1	
CO*	2.0	2.0				2.0		2.0				1.2		1.6	

Level: 3 – High, 2 – Moderate, 1 - Low

26SOTL2301	Java Programming Lab (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		0	0	2	1

Prerequisite: Basic knowledge of computer fundamentals.

Course Description:

This laboratory course complements Programming for Problem Solving Using C by providing hands-on practice in algorithm design and C programming. Students write, debug and execute C programs covering control structures, arrays, strings, functions, recursion, pointers, structures, unions and file handling, building the practical skills needed to solve computational problems.

Course Objectives:

1. To implement algorithms and flowcharts as working C programs to solve computational problems.
2. To practice writing C programs using decision-making and looping statements.
3. To develop programs using arrays, strings, functions and recursion.
4. To implement programs using pointers, structures, unions and dynamic memory allocation.
5. To develop C programs involving file handling to solve real-world problems.

List of Experiments:

Exp. No	Title of the Experiment	COs
1	Java Environment Setup and Basic Programs a) Install JDK, configure environment variables, and verify Java installation. b) Write a Java program to display "Hello World". c) Develop a program to perform arithmetic operations using command-line arguments. d) Write a program to read user input using the Scanner class.	CO1
2	Operators and Control Statements a) Program to determine the largest of three numbers. b) Program to calculate the grade of a student using if-else ladder. c) Program to generate multiplication tables using loops. d) Program to check whether a number is prime, palindrome, and Armstrong number. e) Program to generate Fibonacci series.	CO1, CO2
3	Arrays and String Manipulation a) Program to perform matrix addition and multiplication. b) Program to sort an array using Bubble Sort and Selection Sort. c) Program to search an element using Linear Search and Binary Search. d) Program to perform string operations (reverse, palindrome, substring, comparison). e) Program to count vowels, consonants, words, and characters in a string.	CO2
4	Classes and Objects a) Develop a Student Management System using classes and objects. b) Create an Employee class with methods to calculate salary. c) Implement a Bank Account class supporting deposit, withdrawal, and balance enquiry. d) Demonstrate object initialization using constructors.	CO2, CO3
5	Constructors and Method Overloading a) Demonstrate default, parameterized, and copy constructors. b) Implement constructor overloading in a Student class.	CO3

	c) Develop a Calculator class demonstrating method overloading for different data types. d) Demonstrate the use of static members and static methods.	
6	Inheritance and Polymorphism a) Implement Single Inheritance using Employee and Manager classes. b) Demonstrate Multilevel Inheritance using Person → Employee → Faculty hierarchy. c) Implement Hierarchical Inheritance for different vehicle types. d) Demonstrate Method Overriding and Dynamic Method Dispatch. e) Develop a payroll system using runtime polymorphism.	CO3
7	Interfaces and Abstract Classes a) Implement an abstract class representing geometric shapes. b) Create interfaces for Payment Systems and implement multiple payment methods. c) Demonstrate multiple inheritance using interfaces. d) Design a Library Management System using interfaces and abstraction.	CO3
8	Exception Handling and Multithreading a) Demonstrate try-catch-finally blocks. b) Handle ArithmeticException, ArrayIndexOutOfBoundsException, and NumberFormatException. c) Develop user-defined exceptions for minimum balance in a bank account. d) Create threads using the Thread class. e) Create threads using the Runnable interface. f) Implement thread priorities and thread communication.	CO3
9	Collections Framework and Generics a) Implement ArrayList for student records. b) Develop programs using LinkedList, Stack, Queue, and PriorityQueue. c) Demonstrate HashSet, TreeSet, HashMap, and TreeMap. d) Implement generic classes and methods. e) Sort objects using Comparable and Comparator interfaces.	CO4
10	File Handling and Serialization a) Read and write text files using FileReader and FileWriter. b) Copy file contents using buffered streams. c) Read and write binary files. d) Serialize and deserialize Java objects. e) Develop a student record management system using file handling.	CO4
11	Database Connectivity using JDBC a) Connect a Java application with a MySQL database. b) Implement CRUD operations using JDBC. c) Develop a Student Database Management System. d) Use PreparedStatement for secure database operations. e) Demonstrate transaction management and ResultSet processing.	CO4
12	Mini Project (Comprehensive Java Application) Develop a object-oriented application integrating the concepts learned throughout the course.	CO5

	Students may choose one of the following: 1. Library Management System 2. Hospital Management System 3. Banking Management System 4. Inventory Management System 5. Student Information System 6. Online Examination System 7. Employee Payroll System The project should include: a) Object-Oriented Design (Classes, Objects, Inheritance, Polymorphism). b) Exception Handling. c) Collections Framework. d) File Handling or JDBC Database Connectivity. e) GUI using Swing/JavaFX (Optional). f) Documentation and Presentation.	
Total Hours		**30 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Develop Java programs using programming fundamentals, arrays, strings, classes, constructors, and objects.	PO1, PO2, PO5	**1,2,3**	**3**
2. Design object-oriented software solutions using inheritance, polymorphism, interfaces, abstraction, and exception handling.	PO1, PO2, PO5	**1,2,3**	**3**
3. Implement concurrent and efficient Java applications using multithreading, collections, generics, lambda expressions, and Stream API.	PO1, PO2, PO3, PO5	**1,2,3**	**4**
4. Develop Java applications with file handling, graphical user interfaces, and database connectivity using JDBC.	PO1, PO2, PO3, PO5	**1,2,3**	**4**
5. Design, implement, test, document, and present a real-world Java application by integrating object-oriented design principles and software engineering best practices.	PO1, PO2, PO3, PO4, PO5, PO12	**1,2,3**	**5**

Reference Books:

1. Java How to Program, Paul Deitel and Harvey Deitel, Pearson, 12th Edition, 2021. ISBN: 978-0134743354.
2. Effective Java, Joshua Bloch, Addison-Wesley Professional, 3rd Edition, 2018. ISBN: 978-0134685999.
3. Java Performance, Scott Oaks, O'Reilly Media, 2nd Edition, 2020. ISBN: 978-1492056117.
4. Beginning Programming with Java for Dummies, Barry Burd, Wiley, 6th Edition, 2023. ISBN: 978-1394183386.
5. Java Concurrency in Practice, Brian Goetz, Tim Peierls, Joshua Bloch, Joseph Bowbeer, David Holmes, and Doug Lea, Addison-Wesley Professional, 1st Edition, 2006. ISBN: 978-0321349606.
6. Modern Java in Action, Raoul-Gabriel Urma, Mario Fusco, and Alan Mycroft, Manning

Publications, 2nd Edition, 2022. ISBN: 978-1617293564.
7. Thinking in Java, Bruce Eckel, Prentice Hall, 4th Edition, 2006. ISBN: 978-0131872484.

Web Links (Online Source):

1. Oracle Java Documentation - https://docs.oracle.com/en/java/
2. The Java™ Tutorials (Oracle Archive) - https://docs.oracle.com/javase/tutorial/
3. OpenJDK Project - https://openjdk.org/

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3		3				1	1		2	3	1	1
CO2	3	3	3	1	3				2	1		2	3	1	1
CO3	3	3	3	2	3				2	1		2	3	1	2
CO4	2	3	3	2	3				2	2	1	2	3	1	2
CO5	3	3	3	3	3				2	2	2	3	3	2	3
CO*	2.8	3	3	2	3	0	0	0	1.8	1.4	1.5	2.2	3.0	1.2	1.8

S	Digital Logic Design Lab (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		0	0	2	1

Prerequisite: Basic Electrical and Electronics Engineering

Course Description:

The digital system design laboratory introduces the hardware description language for the design and development of digital integrated circuits and field programmable devices. It provides VHDL/Verilog language elements, synthesizable register transfer logic models in structural, dataflow, and behavioural modelling of combinational and sequential circuits. This laboratory includes basic building blocks for applications to VLSI chips.

Course Objectives:

1. Understand the pin configuration of various logic gate ICs.
2. Realize De Morgan's theorem, SOP and POS forms.
3. Analyze the functionality of adders, subtractors, code converters and vice versa.
4. Verify the functionality of multiplexers, demultiplexers, decoders and encoders.
5. Verify the functionality of flip-flops, counters and shift registers.

List of Experiments:

Exp. No	Title of the Experiment	COs
Part A – Hardware Experiments (Using ICs)		
1	Verification of basic logic gates, Boolean identities and De Morgan's theorems.	CO1
2	Realization of Boolean Expressions using Gates.	CO1
3	Design and realization of a 4-bit Gray to Binary and Binary to Gray Converter.	CO1
4	Verify the functionality of Adders and Subtractors.	CO2
5	Verify the functionality of Multiplexer and Demultiplexer.	CO2
6	Verify the functionality of Encoder and Decoder.	CO2
7	Design and implementation of a Magnitude Comparator.	CO2
8	Design and implementation of JK, D, and T Flip-Flops.	CO3
9	Design and implementation of Counters (Asynchronous and Synchronous).	CO3
10	Design and implementation of Shift Registers.	CO3
Part B – Software Experiments (Using Verilog HDL)		
1	Simulation of basic logic gates using Verilog HDL.	CO4
2	Simulation and verification of Verilog operators.	CO4
3	Design and simulation of Boolean expressions using Karnaugh Maps (K-Maps).	CO4
4	Design and simulation of Multiplexers, Demultiplexers, Encoders, and Decoders.	CO4
5	Design and simulation of an Arithmetic Logic Unit (4-bit ALU).	CO4
6	Design and simulation of Flip-Flops and Registers.	CO5
7	Design and simulation of Counters and Shift Registers.	CO5
8	Design and simulation of Finite State Machines (Moore and Mealy Models).	CO5
9	Design and simulation of a Sequence Detector using FSM.	CO5
Total Hours		**30 Hrs**

Course Outcomes:	POs	PSOs	Peak BTL
1. Construct basic combinational circuits and verify their functionality.	PO1, PO2	**1,2**	**3**

2. Design, test and evaluate various combinational circuits such as adders, subtractors, multiplexers, demultiplexers, decoders, etc.	PO1, PO2, PO3	**1,2**	**4**
3. Construct sequential circuits and verify their functionality.	PO1, PO2, PO3	**1,2**	**3**
4. Simulate various combinational circuits using VHDL/Verilog HDL.	PO1, PO2, PO3	**1,2**	**3**
5. Simulate sequential circuits such as flip-flops, counters, etc. using VHDL/Verilog HDL.	PO1, PO2, PO3	**1,2**	**3**

Reference Books:

1. Anand Kumar, Switching Theory and Logic Design, 2/e, PHI, 2014.
2. Charles Roth, Digital System Design using Verilog HDL, Tata McGraw Hill, 2/e, 2012.
3. R.P. Jain, Modern Digital Electronics, Tata McGraw Hill, 4/e, 2009.
4. Donald D. Givone, Digital Principles and Design, McGraw Hill, 2002.

Web Links (Online Source):

1. https://nptel.ac.in/courses/117105080
2. https://nptel.ac.in/courses/106103358

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**3**											**3**	**3**	
CO2	**2**	**3**	**3**										**3**	**3**	
CO3	**3**	**2**	**2**										**3**	**3**	
CO4	**2**	**3**	**3**										**3**	**3**	
CO5	**2**	**3**	**3**										**3**	**3**	

Level: 3 – High, 2 – Moderate, 1 - Low

26SOTJ2301	Software Development using Git (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		1	0	2	2

Prerequisite: Programming for Problem Solving (Sem II); basic operating-system and command-line familiarity (Sem I IT Workshop).

Co-requisite: Object-Oriented Programming through Java (concurrent).

Course Description:

This laboratory-only Skill Enhancement Course builds practical fluency in distributed version control and collaborative software development practices. Students progress from core Git operations through branching and merging; GitHub-based collaboration (pull requests, code review, and issue tracking); professional repository management; and a foundational introduction to continuous integration using GitHub Actions. The course directly prepares students for team-based capstone projects (Sem V–VIII) and industry-standard internship workflows, addressing a skill gap not covered elsewhere in the curriculum.

Course Objectives:

1. To introduce distributed version control concepts and build practical fluency in Git commands and workflows.
2. To develop the ability to collaborate on shared codebases using branching, merging, and conflict-resolution strategies.
3. To build competence in GitHub-based team workflows—pull requests, code review, issue tracking, and project boards.
4. To introduce the foundational concept of continuous integration and set up a basic automated build/test pipeline.

List of Experiments:

Exp. No.	Title of the Experiment	Hours
1	Install and configure Git; set global username/email; initialize a local repository and inspect the .git structure.	2
2	Create a project; stage and commit changes incrementally; inspect history using git log, git status, and git diff.	2
3	Clone an existing public repository and explore its directory structure and commit graph.	2
4	Create feature branches, make independent changes to each, and merge them back into main.	2
5	Deliberately create and resolve a merge conflict between two branches; compare merge with rebase.	2
6	Practice git stash, reset (soft/mixed/hard), and revert on sample commits; write a project-specific .gitignore.	2
7	Fork a peer's repository, make a change on a feature branch, and raise a pull request with a clear description.	2

8	Perform a structured code review on a classmate's pull request using inline review comments.	2
9	Set up GitHub Issues and a project board to track tasks for a small team assignment.	2
10	Author a complete, professional README (purpose, setup, usage, contributors) for a team repository.	2
11	Simulate a 3–4 member team repository with a protected main branch and mandatory PR review before merging.	2
12	Create a tagged release (v1.0) with release notes for a completed mini-module; explore a basic Git hook.	2
13	Write a basic GitHub Actions workflow (YAML) that runs a linter or test suite automatically on every push.	2
14	Add a build-status badge to the repository README reflecting the CI workflow result.	2
15	Capstone mini-project: a 3-member team builds a small application in a shared repository using feature branches, PR-based review, and an active CI check, culminating in a tagged v1.0 release.	2
Total Hours		**30 hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Explain the need for version control and perform core Git operations (init, add, commit, log, diff) on a local repository.	PO1, PO2, PO5	**1, 2**	**2**
2. Apply branching, merging, and rebasing operations and resolve merge conflicts on a shared codebase.	PO2, PO3, PO5	**1, 2**	**3**
3. Collaborate on a shared GitHub repository using forks, pull requests, and structured code review.	PO3, PO5, PO9, PO10	**1, 2, 3**	**3**
4. Organize and document a team repository following professional conventions (README, .gitignore, commit standards, tags, and releases).	PO3, PO5, PO9, PO10, PO12	**1, 2, 3**	**4**
5. Develop a basic Continuous Integration workflow using GitHub Actions that automatically lints and tests code on every push.	PO3, PO5, PO9, PO11, PO12	**1, 2, 3**	**4**

Text Books:

1. Pro Git, Scott Chacon and Ben Straub, 2/e, 2014, Apress (open access at git-scm.com/book).

Reference Books:

1. Version Control with Git, Jon Loeliger and Matthew McCullough, 2/e, 2012, O'Reilly Media.
2. Pragmatic Version Control Using Git, Travis Swicegood, 2008, Pragmatic Bookshelf.
3. Git Pocket Guide, Richard E. Silverman, 2013, O'Reilly Media.
4. Learning GitHub Actions, Brent Laster, 2023, O'Reilly Media.

Web Links (Online Source):

1. https://git-scm.com/doc
2. https://docs.github.com/en/pull-requests
3. https://docs.github.com/actions
4. https://skills.github.com
5. https://nptel.ac.in/courses/106105182

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2			3								1	2	
CO2		2	2		3								1	2	
CO3			2		3				2	2				3	1
CO4			2		3				3	3		2		3	1
CO5			3		3				3		2	3		3	2
CO*	2.0	2.0	2.3		3.0				2.7	2.5	2.0	2.5	1.0	2.6	1.3

Level: 3 – High, 2 – Moderate, 1 – Low

UNIVERSITY ELECTIVE-III

SEMESTER-III

26TAUT2201A	COSMETIC SCIENCE	L	T	P	C
		3	0	0	3

Course Description:

This course provides a foundational understanding of cosmetic sciences, covering the classification and basic ingredients of cosmetic and cosmeceutical products, and the structure and functions of skin, hair, and the oral cavity. It introduces common skin, hair, and oral care products along with their formulation basics, advantages, and everyday uses. The course also covers herbal cosmetics, the benefits of natural ingredients, and the fundamentals of sun protection, along with quality evaluation, safety, storage, and consumer awareness related to cosmetic products. In addition, students will learn to identify common cosmetic problems affecting skin and hair and adopt appropriate personal care practices.

Course Objectives:

The objective of this course is to make students to:

1. Understand the basic concepts of cosmetics and cosmeceuticals, their classification, key ingredients, and the structure and functions of skin, hair, and oral cavity.
2. Gain knowledge of common skin, hair, and oral care products, their composition, advantages, and uses in daily life.
3. Analyze herbal cosmetics, the benefits of natural ingredients, and the fundamentals of sun protection including the basic concept of SPF.
4. Evaluate cosmetic products based on quality parameters, safety, storage, shelf-life, and appropriate selection according to skin type.
5. Identify common cosmetic problems related to skin and hair and apply suitable personal care practices to maintain skin and hair health.

Unit - I	**Introduction to Cosmetics and Skin Care**	**8 Hrs**

Introduction to Cosmetics and Cosmeceuticals; Classification of Cosmetic Products; Basic Ingredients Used in Cosmetics: Surfactants, Humectants, Emollients, Preservatives (overview only); Basic Structure and Functions of Skin, Hair, and Oral Cavity; Common Cosmetic Products Used in Daily Life

Unit - II	**Skin, Hair and Oral Care Products**	**10 Hrs**

Skin Care Products: Face Wash, Moisturizers, Cold Cream, Sunscreen – Advantages and Uses; Hair Care Products: Shampoo, Hair Conditioner, Hair Oil, Anti-dandruff Shampoo; Oral Care Products: Toothpaste, Mouthwash, Teeth Whitening Products

Unit - III	**Herbal Cosmetics and Sun Protection**	**9 Hrs**

Introduction to Herbal Cosmetics; Benefits of Herbal Ingredients: Aloe Vera, Turmeric, Henna, Amla, Neem, Clove; Introduction to Sunscreens; Importance of Sun Protection; Basic Concept of SPF

Unit - IV	**Cosmetic Products and Their Evaluation**	**9 Hrs**

Soaps and Syndet Bars; Selection of Cosmetics Based on Skin Type; Basic Quality Parameters of Cosmetics; Safety, Storage and Shelf-life of Cosmetic Products; Consumer Awareness and Label Reading		
Unit - V	**Common Cosmetic Problems and Personal Care**	**9 Hrs**
Skin Problems: Oily Skin, Dry Skin, Acne, Wrinkles, Body Odor; Hair Problems: Dandruff, Hair Fall; Personal Care: Skin Moisturization, Healthy Skin and Hair Care Practices, Safe Use of Cosmetic Products		
Total Hours		**45 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Explain the fundamental concepts of cosmetics and cosmeceuticals, their classification, basic ingredients, and the structure and functions of skin, hair, and oral cavity.	PO1, PO2	PSO1	**L2**
2. Describe common skin, hair, and oral care products, their composition, advantages, and uses in daily life.	PO1, PO2	PSO1	**L2**
3. Apply knowledge of herbal ingredients and sun-protection principles to assess the suitability of cosmetic products.	PO2, PO3	PSO1, PSO2	**L3**
4. Analyze the quality, safety, storage, and labeling parameters used to select appropriate cosmetic products for different skin types.	PO2, PO8	PSO1, PSO3	**L4**
5. Assess common cosmetic problems related to skin and hair and recommend suitable personal care practices.	PO3, PO12	PSO1	**L5**

Text Books:

1. Harry's Cosmeticology, Wilkinson, Moore, Seventh Edition, George Godwin.

2. Cosmetics – Formulations, Manufacturing and Quality Control, P.P. Sharma, 4th Edition, Vandana Publications Pvt. Ltd., Delhi.

3. Textbook of Cosmeticology, Sanju Nanda & Roop K. Khar, Tata Publishers.

Reference Books:

1. Poucher's Perfumes, Cosmetics and Soaps, Hilda Butler, 10th Edition, Springer.

2. Beginning Cosmetic Chemistry, Randy Schueller and Perry Romanowski, 3rd Edition, Allured Business Media.

3. Cosmetic Formulation of Skin Care Products, Zoe Diana Draelos and Lauren A. Thaman, CRC Press.

Web Links (Online Source):

1. https://www.fda.gov/cosmetics
2. https://www.scconline.org/
3. https://ifscc.org/
4. https://www.cir-safety.org/
5. https://www.personalcarecouncil.org/

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2											2		
CO2	2	2											2		
CO3		2	2										2	2	
CO4		2						2					2		2
CO5			2									2	2		
CO*	2.5	2.0	2.0					2.0				2.0	2.0	2.0	2.0

Level: 3 - High, 2 - Moderate, 1 – Low

26TAUT2201B	INFECTION PREVENTION & CONTROL	L	T	P	C
		3	0	0	3

Course Description:

This course covers infection control principles, antibiotic resistance, and antimicrobial stewardship. Students will learn about sterilization, disinfection, hand hygiene, PPE, and managing drug resistance in healthcare settings.

Course Objectives:

Students undergoing this course are expected to:

1. Understand evidence-based infection control practices.
2. Learn prevention and control of healthcare-associated infections.
3. Analyse the history and mechanisms of antibiotic resistance.
4. Examine trends and actions to combat drug resistance.
5. Implement antimicrobial stewardship in hospitals.

Unit - I	Evidence-based infection control principles and practices	9 Hrs
Sterilization, Disinfection, Effective hand hygiene, Use of Personal Protective Equipment (PPE).		
Unit - II	**Infection control**	**9 Hrs**
Prevention & control of common healthcare-associated infections, Components of an effective infection control program, Guidelines (NABH and JCI) for Hospital Infection Control.		
Unit - III	**Antibiotics**	**9 Hrs**
Antibiotic Resistance, History of antibiotics, How resistance happens and spreads, Types of resistance-intrinsic, acquired, passive.		
Unit - IV	**Drug resistance**	**9 Hrs**
Trends in drug resistance, Actions to fight resistance, Bacterial persistence, Antibiotic sensitivity.		
Unit - V		**9 Hrs**
Consequences of antibiotic resistance, Antimicrobial Stewardship – Barriers and opportunities, tools and models in hospitals		
Total Hours		**45 Hrs**

Course Outcomes:	POs	PSOs	Peak BTL
At the end of this course, students should be able to: 1. Apply effective infection control practices.	PO1, PO5	PSO1, PSO2	**L3**
2. Prevent and manage healthcare-associated infections.	PO1, PO6	PSO1	**L3**
3. Explain the history and spread of antibiotic resistance.	PO2, PO4	PSO1	**L2**
4. Identify and combat drug resistance trends.	PO2, PO12	PSO1	**L3**

5. Implement antimicrobial stewardship strategies.	PO8, PO9	PSO3	**L3**

Text Books:

1. "Infection Prevention and Control: Theory and Practice for Healthcare Professionals" by Debbie Weston
2. "Antibiotics: Actions, Origins, Resistance" by Christopher Walsh

Reference Books:

1. "Antimicrobial Stewardship: Principles and Practice" by Matthew Laundy, Lynda A. Sisson, and Matthew Dryden

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**				**2**								**2**	**2**	
CO2	**2**					**2**							**2**		
CO3		**3**		**2**									**2**		
CO4		**2**										**2**	**2**		
CO5								**3**	**2**						**3**
CO*	**2.5**	**2.5**		**2.0**	**2.0**	**2.0**		**3.0**	**2.0**			**2.0**	**2.0**	**2.0**	**3.0**

Level: 3 - High, 2 - Moderate, 1 – Low

26TAUT2201C	ANTIBIOTIC RESISTANCE & BIOMEDICAL WASTE MANAGEMENT	L	T	P	C
		3	0	0	3

Course Description:

This course covers antibiotics and drug resistance, including mechanisms and trends, and explores biomedical waste management, focusing on segregation, treatment, and disposal. Emphasis is placed on antimicrobial stewardship and modern technologies for handling biomedical waste and ensuring environmental safety.

Course Objectives:

Students undergoing this course are expected to:

1. Understand the history, mechanisms, and types of antibiotic resistance.
2. Analyze trends in drug resistance and actions to combat it.
3. Evaluate the consequences of antibiotic resistance and implement antimicrobial stewardship.
4. Learn principles and practices of biomedical waste management and environmental safety.
5. Utilize modern technologies and personal protective equipment for effective biomedical waste handling.

Unit - I	**Antibiotics**	**9 Hrs**

Antibiotic Resistance, History of antibiotics, How resistance happens and spreads, Types of resistance-intrinsic, acquired, passive.

Unit - II	**Drug resistance - I**	**9 Hrs**

Trends in drug resistance, Actions to fight resistance, Bacterial persistence, Antibiotic sensitivity

Unit - III	**Drug resistance - II**	**9 Hrs**

Consequences of antibiotic resistance, Antimicrobial Stewardship – Barriers and opportunities, tools and models in hospitals.

Unit - IV	**Biomedical waste management and environmental safety - I**	**9 Hrs**

Definition of Biomedical, Waste, Waste minimization, BMW – Segregation, collection, transportation, treatment and disposal (including colour coding).

Unit - V	**Biomedical waste management and environmental safety - II**	**9 Hrs**

Liquid BMW, Radioactive waste, Metals / Chemicals / Drug waste, BMW Management & methods of disinfection, Modern Technology for Handling BMW, Use of Personal protective equipment (PPE), Monitoring & controlling cross-infection (Protective devices).

Total Hours	**45 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
At the end of this course, students should be able to:	PO1, PO2	PSO1	**L2**

1. Explain antibiotic resistance, its history, and mechanisms.			
2. Analyse trends and strategies in drug resistance management.	PO2, PO4	PSO1	**L4**
3. Assess the consequences of antibiotic resistance and implement antimicrobial stewardship.	PO2, PO8	PSO1, PSO3	**L5**
4. Understand principles and practices of biomedical waste management.	PO1, PO7	PSO1	**L2**
5. Apply modern technologies and PPE for effective biomedical waste handling and infection control.	PO5, PO7	PSO2	**L3**
Text Books: 1. "Antibiotics: Actions, Origins, Resistance" by Christopher Walsh 2. "Antimicrobial Stewardship: Principles and Practice" by Matthew Laundy, Lynda A. Sisson, and Matthew Dryden.			
Reference Books: 1. "Biomedical Waste Management in Hospitals: A Manual for Health Professionals" by Sushrut S. N. H.			

CO-POs/PSOs Mapping

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**	**2**											**2**		
CO2		**3**		**2**									**2**		
CO3		**2**						**2**					**2**		**2**
CO4	**2**						**2**						**2**		
CO5					**2**		**3**							**2**	
CO*	**2.5**	**2.3**		**2.0**	**2.0**		**2.5**	**2.0**					**2.0**	**2.0**	**2.0**

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT2201D	MEDICAL TERMINOLOGY	L	T	P	C
		3	0	0	3

Course Description:

The purpose of this course is to develop a student's understanding and use of hospital and medical terminology. There is a focus on understanding the terns commonly used to identify the cause and effects of disease conditions.

Course Objectives:

1. To understand the associate medical terms with specific body systems.
2. To identify and interpret diagnostic and symptomatic terms related to the diseases specific to each body system.
3. To describe designated diagnostic testing procedures (laboratory, x-ray, surgical, pharmacy, etc.).
4. To Enable students to understand, use, and correctly pronounce a wide range of medical terms.
5. To Prepare students to effectively communicate with healthcare professionals and patients using accurate medical terminology.

Unit - I		**9 Hrs**
Basics of medical terminology, Specialties in a Hospital, The Human body in health and disease		
Unit - II		**9 Hrs**
The Skeletal System, The Muscular System, The lymphatic and immune systems		
Unit - III		**9 Hrs**
The Respiratory System, The Circulatory System, The Digestive System, The Urinary System		
Unit - IV		**9 Hrs**
The Nervous system, Special senses - Eyes and Ears, Skin - The Integumentary system		
Unit - V		**9 Hrs**
The Endocrine system, The Reproductive System, Diagnostic procedures, Nuclear Medicine and Pharmacology		
Total Hours		**45 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
Upon successful completion of the course student would be – 1. Able to Identify and interpret complex medical terms by breaking them into their component word parts in order to decipher their meaning.	PO1, PO2	PSO1	**L4**
2. Able to understand common diseases and disorders of the body systems	PO1, PO2	PSO1	**L2**

3. Able to identify diagnostic tools and techniques for the common diseases and disorders of the human body	PO1, PO2, PO5	PSO1, PSO2	**L2**
4. Able to interpret medical records, lab reports, and other documentation to ensure clear and precise communication within healthcare teams and with patients	PO1, PO10	PSO3	**L3**
5. Able to learn the roots, prefixes, and suffixes that form medical terms, as well as the terminology related to various body systems, diseases, procedures, and treatments. Students will be able to deconstruct complex terms into their component parts to understand their meanings.	PO1, PO12	PSO1	**L4**

Text Books:

1. Medical Terminology for Health Professions, 7th Edition by Ann Ehrlich; Carol L Schroeder, ISBN 13: 9781111543297, Published by Delmar Cengage Learning (2013)

2. Workbook for Ehrlich/Schroeder's Medical Terminology for Health Professions, 7th by Carol Schroeder, Ann Ehrlich Published by Delmar Cengage Learning; 7th edition, 2012, ISBN-13 978-1111543280

Reference Books:

1. Quick and Easy Medical Terminology - With Access by Peggy C. Leonard, ISBN13: 978-0323595995, 9th Edition

2. Medical Terminology Systems: A Body Systems Approach - With Access by Barbara A. Gylys, ISBN13: 978-0803658677, 8th Edition

3. Understanding Medical Terminology by Agnes C. Frenay, ISBN13: 978-0697140586, 9th Edition

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**2**											**3**		
CO2	**3**	**2**											**3**		
CO3	**2**	**3**			**2**								**2**	**2**	
CO4	**2**									**3**					**3**
CO5	**3**											**2**	**2**		
CO*	**2.6**	**2.3**			**2.0**					**3.0**		**2.0**	**2.5**	**2.0**	**3.0**

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT2201E	CLINICAL NUTRITION	L	T	P	C
		3	0	0	3

Course Description:

Upon completion of the course, students will be prepared to apply their knowledge of clinical nutrition to promote health and manage diseases effectively, contributing to multidisciplinary healthcare teams. This course is essential for healthcare professionals, nutritionists, dietitians, and anyone interested in understanding the role of nutrition in clinical care and wellness promotion.

Course Objectives:

To enable the students to:

1. Develop proficiency in conducting comprehensive nutritional assessments using various methods such as dietary recall, biochemical tests, and anthropometric measurements.
2. Understand the impact of diet on the prevention, management, and progression of chronic diseases commonly encountered in clinical practice, including diabetes, cardiovascular diseases, and obesity.
3. Acquire skills in designing individualized nutrition plans tailored to specific patient needs and health conditions across different life stages (e.g., pediatric, geriatric, maternal).
4. Evaluate ethical issues related to nutritional counseling, respecting cultural dietary practices, and providing evidence-based dietary recommendations within clinical settings.
5. Critically appraise current research and controversies in clinical nutrition, integrating evidence-based guidelines into decision-making processes to optimize patient outcomes.

Unit - I		9 Hrs

Introduction to nutrition - Food as source of nutrients, functions of food, definition of nutrition, nutrients & energy, adequate, optimum & good nutrition, malnutrition, Effect of cooking & heat processing on the nutritive value of foods, role of nutrition in prior pregnancy, during pregnancy, during lactation, in adolescence, Fitness, Athletics & Sports

Unit - II		9 Hrs

Food guide - Basic five food groups How to use food guide (according to R.D.A.) Interrelationship between nutrition & health: - Visible symptoms of good health, Use of food in body - Digestion, Absorption, transport & utilization, Role of fibres in human nutrition. malnutrition, Protein energy malnutrition.

Unit - III		9 Hrs

Biomolecules as a nutrient: Carbohydrates: Functions, classification, food sources, storage in body. Fats & oils: composition, saturated and unsaturated fatty acids, classification, food sources, function of fats. Proteins - composition, sources, essential & non-essential amino acids, functions, Protein deficiency.

Unit - IV		9 Hrs

Water minerals and Vitamins: Water - as a nutrient, function, sources, requirement, water balance & effect of deficiency. Minerals - macro & micronutrients. - Functions, sources. Bioavailability and deficiency of Calcium, Iron, Iodine, Sodium & Potassium, Vitamins (water & fat soluble) - definition, classification & functions.

Unit - V		**9 Hrs**
Role of nutrients in disease management: Importance of nutrition in kidney and liver diseases with respect to their nutritional value. Case study- diabetes, cancer, Osteoporosis, Heart related diseases, role of Antioxidants as a nutrient in disease control.		
Total Hours		**45 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
Upon completion of the course, the student shall be able to 1. Demonstrate proficiency in conducting thorough nutritional assessments using a variety of methods, interpreting results, and applying findings to develop dietary recommendations.	PO1, PO2, PO4, PO5	PSO1	**L3**
2. Apply knowledge of macro and micronutrients, dietary supplements, and hydration to design effective nutrition plans for individuals with diverse health needs and conditions.	PO1, PO3, PO5	PSO1, PSO2	**L3**
3. Implement dietary interventions that contribute to the prevention, management, and improvement of chronic diseases, integrating nutritional strategies into comprehensive healthcare plans.	PO1, PO3, PO6	PSO1	**L3**
4. Evaluate and address ethical considerations in nutritional counselling, respecting cultural diversity and individual preferences while adhering to professional standards and evidence-based practices.	PO6, PO8, PO9	PSO3	**L5**
5. Critically analyze current research literature in clinical nutrition, utilizing evidence-based guidelines to make informed decisions and enhance patient outcomes in clinical settings.	PO4, PO10, PO12	PSO1, PSO2	**L4**

Text Books:

1. Kathleen ML and Escott S. Krause's Food, Nutrition and Diet Therapy, 9thedn, W.B. Saunders Company Pennsylvania, 2000.

2. Davidson S, Passmore R, Breck JFT. Human Nutrition and Dietetics, The English Language Book Society and Churchill Livingston, 1975.

Reference Books:

1. Thomas B. Manual of Dietetic Practice. Blackwell Scientific Publications, Oxford, London, 1988.

2. Robinson CH. Normal and Therapeutic Nutrition. Oxford Publishing Co, Bombay, 1972.

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2		2	2								3		
CO2	3		3		2								3	2	
CO3	2		3			2							3		
CO4						2		3	2						3
CO5				2						2		3	2	2	
CO*	2.7	2.0	3.0	2.0	2.0	2.0		3.0	2.0	2.0		3.0	2.8	2.0	3.0

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT2201F	BEHAVIOR CHANGE COMMUNICATION	L	T	P	C
		3	0	0	3

Course Description:

This course introduces students to the fundamentals of behavioral theory, research and interventions in health education and promotion. The course will expose students to a wide range of theories, basic statistics and the use of open-source software in the analysis and evaluation of health aspects at the community level in a holistic manner. Furthermore, students will understand the concept of intersectoral and multidisciplinary coordination in order to improve data visualization in health education and promotion through the use of appropriate statistical tools.

Course Objectives:

1. To understand the behavioral, social and cultural factors associated with health and illness.
2. To explore factors that influence and barriers to practicing health behavior and changing poor health habits across age groups.
3. To understand the structure of society, the role of society and various types of communication and identify the role of society, community, health education and communication in health.
4. To describe the methods, models, tools and processes used in understanding health behavior change, health education and promotion.
5. To apply relevant social and behavioral theories to diagnose and understand individual, social network, organizational, community and policymaker behaviors associated with the planning, implementation, evaluation and maintenance of community-based primary health care programs.

Unit - I		5 Hrs

Introduction to Social and Health Behavioral Health, Importance of social and behavioral factors in health, Historical perspectives on population and diseases.

Unit - II		8 Hrs

Health behavior: role of behavior factors in disease and disorders, Health behavior, health habits, Illness behavior, Practicing and changing health behavior, Barrier to modify poor health behavior, intervening with children, adolescents, adults and at risk, social determinants of Health, Changing health habits.

Unit - III		12 Hrs

Basic concepts of society, community, and family, Society: features and types, Concept of culture: characteristics, elements, variability, social institutions: marriage and family. Working with communities, Community: Definition, concept of community participation, Benefits of community participation, Health communication, Communication: Definition, scope and requirements, Types of communication, Components of communication, Communication stages, Common communication approach, Methods of communication, Characteristics of effective communication, Barriers of effective communication.

Unit - IV		10 Hrs

Health Behavior Models, Social Epidemiology, Health belief model, Theory of planned behavior, Transtheoretical Model and change process, Social network theory, Diffusion of innovation, Social reaction to diseases, Comparative health cultures, Health disparities.

Unit - V		**10 Hrs**
Introduction Social network analysis, Basic of social network analysis, Introduction to open-source software and classification in health approaches, Introduction to Node XL software, Install, data visualize, data analysis and application among community level for policy-maker behaviors associated with the planning, implementation, evaluation, and maintenance of community-based health programs.		
Total Hours		**45 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
End of the course completion student would be 1. Understand behavioral, social and cultural factors associated with health and illness.	PO1, PO6	PSO1	**L2**
2. Develop strategies to address barriers to practicing healthy behaviors and changing poor health habits across age groups.	PO2, PO3	PSO1	**L3**
3. Analyze the structure of society and various types of communication and identify the role of society, community, health education and communication in health.	PO2, PO10	PSO1	**L4**
4. Apply appropriate methods, models, tools and processes for understanding health behavior change, health education and promotion.	PO3, PO5	PSO2	**L3**
5. Utilize SNA tools, strategies and social and behavioral theories to diagnose and understand individual, social network, organizational, community and policymaker behaviors in community-based primary health care programs.	PO5, PO9	PSO2	**L4**

Text Books:

1. Essentials of health behavior: Social and behavioral theory in public health by Mark Edberg (Jones and Bartlett publishers

2. Mahajan BK. Methods in Bio-statistics. Jaypee Brothers, Medical Publishers (p) Ltd., G16, EMCA House, 23/23B, Ansari Road, Daryaganj, Post Box: 7193, New Delhi 110 002, India, 1991. List Current Essential Reference

Reference Books:

1. Foster and Anderson: Medical Anthropology, Wiley, New York

2. Anderson & Taylor, Sociology: Understanding a Diverse Society.

3. Neubeck and Glasberg, Selected Material from Sociology: Diversity, Conflict, and Change.

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2					2							2		
CO2		2	2										2		
CO3		3								2			2		
CO4			2		2									2	
CO5					3				2					3	
CO*	2.0	2.5	2.0		2.5	2.0			2.0	2.0			2.0	2.5	

Level: 3 - High, 2 - Moderate, 1 – Low

26TAUT2201G	SOCIAL NETWORK ANALYSIS	L	T	P	C
		3	0	0	3

Course Description:

This course introduces the principles and applications of Social Network Analysis (SNA) in public health. It covers network concepts, data collection, visualization, network measures, and their applications in disease transmission, health communication, health systems, and policy. The course also introduces digital networks, artificial intelligence and SNA software for evidence-based public health decision-making.

Course Objectives:

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

1. Explain the fundamental concepts and principles of Social Network Analysis (SNA).
2. Apply network measures and visualization techniques to health-related networks.
3. Analyze disease transmission, health behaviors, and health systems using SNA.
4. Use SNA software to interpret network data for public health decision-making.
5. Evaluate emerging applications and ethical issues of SNA in public health.

Unit - I	Foundations of Social Network Analysis	9 Hrs

Introduction to Social Network Analysis; History and evolution of SNA; Basic concepts—nodes, ties, networks, ego and whole networks; Types of networks (social, organizational, communication, healthcare, digital); Network theories including Strength of Weak Ties, Diffusion of Innovation, Social Capital and Small World Theory; Applications of SNA in public health, epidemiology, implementation science, health systems, behavioral sciences and policy.

Unit - II	Network Data Collection and Visualization	9 Hrs

Network study designs; Whole network and ego-centric studies; Data collection methods including surveys, interviews, observations, digital platforms and administrative databases; Ethical issues in network research; Data management and cleaning; Network visualization; Introduction to Gephi, NodeXL, UCINET, NetDraw and R (igraph); Creating and interpreting sociograms.

Unit - III	Network Measures and Public Health Analytics	9 Hrs

Network size, density and cohesion; Degree, closeness, betweenness and eigenvector centrality; Reciprocity and transitivity; Components and communities; Brokerage and structural holes; Network homophily; Diffusion and contagion models; Identifying key influencers and opinion leaders; Applications in infectious disease transmission, vaccination strategies, HIV/STI prevention, tuberculosis, NCD risk behaviors and mental health.

Unit - IV	Social Networks in Health Systems and Community Health	9 Hrs

Community engagement and participatory networks; Health workforce and referral networks; Organizational network analysis; Health policy and stakeholder mapping; Implementation science; One Health networks; Emergency preparedness and disaster response networks; Social support networks; Health communication and risk communication; Digital health ecosystems.

Unit - V	Emerging Trends in Social Network Analysis	9 Hrs

Digital epidemiology and infodemiology; Social media analytics; Misinformation and vaccine hesitancy networks; Artificial Intelligence and Machine Learning in network analytics; Big data and dynamic networks; Precision Public Health; Network interventions; Equity, ethics and privacy in network research; Future directions and real-world public health case studies including COVID-19, AMR surveillance, climate-health networks and One Health collaborations.			
Total Hours			**45 Hrs**
Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
By the end of the course, students will be able to: 1. Explain the concepts and methodologies of Social Network Analysis (SNA).	PO1, PO2	PSO1	**L2**
2. Apply network measures and visualization techniques to health networks.	PO3, PO5	PSO2	**L3**
3. Analyze disease transmission, health behaviors, and health systems using SNA.	PO2, PO4	PSO1	**L4**
4. Utilize SNA software for evidence-based public health research and decision-making.	PO5, PO11	PSO2	**L3**
5. Evaluate emerging applications and ethical issues in Social Network Analysis.	PO8, PO12	PSO3	**L5**
Text Books: 1. Borgatti SP, Everett MG, Johnson JC. Analyzing Social Networks. 2nd Edition. Sage Publications. 2. Luke DA, Harris JK. Network Analysis in Public Health: History, Methods and Applications. Annual Review of Public Health.			
Reference Books: 1. Wasserman S, Faust K. Social Network Analysis: Methods and Applications. Cambridge University Press. 2. Valente TW. Social Networks and Health: Models, Methods and Applications. Oxford University Press. 3. Luke DA. A User's Guide to Network Analysis in Public Health. Springer.			
Competency & Framework Alignment:			
Framework	**Alignment**		
WHO Essential Public Health Functions (EPHF)	EPHF-1: Surveillance, EPHF-2: Emergency Preparedness, EPHF-4: Health Promotion, EPHF-6: Governance, EPHF-8: Research & Innovation		
ICAPHE Competency Framework	Domain II: Epidemiology & Biostatistics, Domain VI: Health Systems & Leadership, Domain VII: Digital Health & Informatics, Domain VIII: Research & Communication		
SDG Mapping	SDG 3, 9, 10, 11, 16 & 17		

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2											2		
CO2			2		3									3	
CO3		3		2									3		
CO4					3						2			3	
CO5								2				2			2
CO*	3.0	2.5	2.0	2.0	3.0			2.0			2.0	2.0	2.5	3.0	2.0

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT2201H	EMOTIONAL INTELLIGENCE & MENTAL HEALTH	L	T	P	C
		3	0	0	3

Course Description:

This course on Emotional Intelligence (EI) introduces students to the foundations, theories, and applications of EI across personal, social, educational, and organizational contexts. It emphasizes self-awareness, self-regulation, motivation, empathy, and social skills as key competencies. Through case studies, activities, and applied exercises, students will develop a practical understanding of EI, its role in effective leadership, mental health, and professional success.

Course Objectives:

1. To introduce the theoretical foundations and models of Emotional Intelligence.
2. To enhance students' intrapersonal skills such as self-awareness, emotional regulation, and motivation.
3. To strengthen interpersonal skills including empathy, social awareness, and relationship management.
4. To apply EI concepts in real-life contexts such as education, healthcare, organizations, and leadership.
5. To encourage personal growth through reflective practices and EI development strategies.

Unit - I	Foundations of Emotional Intelligence	9 Hrs

Definition & importance of emotion intelligence, History & evolution of EI: ability, trait & mixed models, Basic components of emotion: cognitive, physiological, behavioral, Neuroscience & psychology behind emotions, Measurement of EI: major instruments (e.g. MSCEIT, EQ-i, ESCI, self-rating scales)

Unit - II	Intrapersonal Competence	9 Hrs

Self-awareness: recognizing one's emotions, emotional triggers, Self-management: emotional regulation, stress, anxiety, coping, resilience, Motivation: how desire, goals, self-efficacy interplay with EI. Emotional maturity and development over lifespan.

Unit - III	Interpersonal Competence	9 Hrs

Social awareness: empathy, perceiving emotions of others, nonverbal communication, Relationship management: effective communication, conflict resolution, social skills, influence. Trust, collaboration, social networks, and emotional climate in groups/teams

Unit - IV	Emotional Intelligence in Contexts	9 Hrs

EI in leadership & organizations, EI in education, healthcare, counselling, and other helping professions, Cross-cultural / diversity issues in EI, EI in crisis and change: dealing with adversity, trauma, emergencies, Technology, social media, and their impact on emotions.

Unit - V	Developing, Applying & Evaluating EI	9 Hrs

Strategies & interventions to develop EI: training, mindfulness, coaching, Emotional intelligence and wellbeing, mental health, Ethical issues, limits, myths, or misunderstandings about EI. Assessing outcomes: how we test growth in EI, feedback, self-assessment

Total Hours	45 Hrs

Course Outcomes:	POs	PSOs	Peak BTL

1. Understand and explain the major theories and models of Emotional Intelligence.	PO1, PO12	PSO1	**L2**
2. Demonstrate improved self-awareness, emotional regulation, and personal motivation.	PO1, PO9	PSO3	**L3**
3. Apply EI skills in building effective interpersonal relationships and teamwork.	PO9, PO10	PSO3	**L3**
4. Critically analyze the role of EI in leadership, education, healthcare, and other domains.	PO2, PO6	PSO1	**L4**
5. Design and implement strategies for developing EI in personal and professional contexts.	PO3, PO12	PSO1, PSO3	**L6**

Text Books:

1. Neff, K. (2011). Self-compassion: Stop Beating Yourself Up and Leave Insecurity Behind. HarperCollins.

2. Goleman, D. (2007). Emotional Intelligence (10th ed.). Bantam Books.

Reference Books:

1. Goleman, D. (1995). Emotional intelligence: Why it can matter more than IQ. New York, NY: Bantam Books.

2. Bradberry, T., & Greaves, J. (2009). Emotional intelligence 2.0. San Diego, CA: TalentSmart.

3. Bradberry, T. (2007). The new emotional intelligence. San Diego, CA: TalentSmart.

4. Mayer, J. D., Salovey, P., & Caruso, D. R. (2002). Mayer-Salovey-Caruso emotional intelligence test (MSCEIT) user's manual. Toronto, ON: Multi-Health Systems.

5. Bar-On, R. (1997). The emotional quotient inventory (EQ-i): Technical manual. Toronto, ON: Multi-Health Systems.

6. Stein, S. J., & Book, H. E. (2011). The EQ edge: Emotional intelligence and your success (3rd ed.). Mississauga, ON: Jossey-Bass.

7. Harvard Business Review. (2015). HBR's 10 must reads on emotional intelligence. Boston, MA: Harvard Business Review Press.

8. Chamine, S. (2012). Positive intelligence: Why only 20% of teams and individuals achieve their true potential and how you can achieve yours. New York, NY: Greenleaf Book Group Press.

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3											2	2		
CO2	2								2						2
CO3									3	3					3
CO4		2				3							2		
CO5			2									3	2		2
CO*	2.5	2.0	2.0			3.0			2.5	3.0		2.5	2.0		2.3

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT2201I	DISABILITY MANAGEMENT	L	T	P	C
		3	0	0	3

Course Description:

Disability Management course is designed to provide students with an in-depth understanding of the strategies, practices, and policies essential for supporting individuals with disabilities in various settings. This course covers the principles and techniques of disability management, focusing on creating inclusive environments in the workplace, educational institutions, and the community.

Course Objectives:

1. Understand the social, medical, and legal aspects of disability.
2. Evaluate the impact of disability on individuals and society.
3. Analyze policies and regulations related to disability management.
4. Develop strategies for supporting individuals with disabilities in various contexts.
5. Promote inclusivity and diversity in the workplace and community.

Unit - I	Introduction to Disability Management	9 Hrs

Definition and classification of disabilities, Historical perspectives on disability, Disability as a social construct, Medical aspects of Disability, Common medical conditions leading to disability, Assessing functional limitations and impairments

Unit - II	Social and Psychological Aspects of Disability	9 Hrs

The impact of disability on quality of life, Stigma and discrimination, Coping and psychological adjustment to disability, Role of healthcare professionals in disability management, Psychological Interventions and Chronic Health Disorders; Therapies, Pharmacological Interventions, Individual Therapy, Relaxation, Stress Management and exercise, Social Support Interventions, Help on the Internet, Support Groups

Unit - III	Legal and Ethical Framework	9 Hrs

Disability rights and legislation, Equal opportunity and anti-discrimination laws, Ethical considerations in disability management, Emerging technologies and their impact on disability management, the future of disability policy and practice

Unit - IV	Workplace Disability Management	9 Hrs

Reasonable accommodation and the Americans with Disabilities Act (ADA), Return-to-work programs Workplace diversity and inclusion, Current Issues

Unit - V	Community and Public Health Approach	9 Hrs

Community resources and services for individuals with disabilities, Accessibility and universal design Disability awareness and advocacy, Analysis of real-life cases in disability management, Developing disability management plans, Accommodation strategies and their implementation, Current Issues and Future Trends

Total Hours	45 Hrs

Course Outcomes:	POs	PSOs	Peak BTL
By the end of the course, the students would be able to; 1. Understand various aspects and causes of disability.	PO1	PSO1	**L2**
2. Get insight on the efficacy of interventions and therapies to deal disability.	PO1, PO2	PSO1	**L4**
3. Assess the ethical and legal consideration of disability.	PO6, PO8	PSO3	**L5**
4. Acknowledge the importance of ADA act and it implementation in workplace.	PO6, PO8	PSO3	**L2**
5. Know and participate in various community-based disability programs.	PO6, PO9, PO12	PSO3	**L3**

Text Books:

1. Preventing chronic disease: a vital investment. WHO global report. Geneva, World Health Organization, 2005 (http://www.who.int/chp/chronic_disease_report/en, accessed 15 May 2008).

2. Singh D. Transforming chronic care: evidence about improving care for people with long-term conditions. Birmingham, University of Birmingham, 2005.

Reference Books:

1. Chronic diseases [web site]. Geneva, World Health Organization, 2008 (http://www.who.int/topics/chronic_disease/en, accessed 15 May 2008).

2. National Center for Health Statistics definitions: health condition [web site]. Atlanta, United States Centers for Disease Control and Prevention, 2008.

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**												**2**		
CO2	**2**	**2**											**2**		
CO3						**2**		**3**							**3**
CO4						**3**		**2**							**2**
CO5						**2**			**2**			**2**			**2**
CO*	**2.5**	**2.0**				**2.3**		**2.5**	**2.0**			**2.0**	**2.0**		**2.3**

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT2201J	HOSPITAL PLANNING AND ORGANIZATION	L	T	P	C
		3	0	0	3

Course Description:

Hospital Planning and Organization is a comprehensive course designed to provide students with a deep understanding of the principles, strategies, and methodologies involved in the planning, design, and management of healthcare facilities. This course explores the intricate processes essential for the efficient functioning and optimal utilization of resources within hospitals and other healthcare settings. Throughout this course, students will delve into key topics such as healthcare facility design principles, spatial planning, infrastructure requirements, regulatory compliance, and budgeting considerations. Emphasis will be placed on the importance of strategic planning in aligning facility resources with the evolving needs of patients, healthcare professionals, and the broader community. Drawing upon real-world case studies and examples, students will analyze the complexities of hospital organization and governance structures, including the roles and responsibilities of various stakeholders such as administrators, clinicians, and support staff. Additionally, students will explore strategies for enhancing operational efficiency, improving patient flow, and ensuring the delivery of high-quality care while maintaining cost-effectiveness. By the end of the course, students will have developed the analytical skills and practical knowledge necessary to contribute effectively to the planning, development, and management of healthcare facilities, thereby playing a crucial role in shaping the future of healthcare delivery.

Course Objectives:

On completion of the course, the students should be able to

1. Understand the fundamental principles and theories underlying hospital planning and organization,
2. Analyze the spatial, functional, and infrastructural requirements of healthcare facilities, considering factors such as patient flow, safety standards, and accessibility for individuals with disabilities.
3. Explore the process of strategic planning in healthcare, including needs assessment, forecasting, and the development of long-term facility plans to accommodate changes in population demographics and healthcare trends.
4. Evaluate different models of hospital governance and management structures, considering their impact on decision-making processes, resource allocation, and organizational culture.
5. Develop critical thinking and problem-solving skills through case studies and practical exercises focused on addressing real-world challenges in hospital planning, organization, and management.

Unit - I		9 Hrs

Hospital Organisation and Structure: hospital, Function, departmentation, Management Structure, Ideal Organisation structure, hospital committee, functions of key departments on medical side, promoting Organisation culture in hospitals. Organisation charts, better patient care, hospitals, beds and utilisation, Functional hospital organization

Unit - II		9 Hrs

Hospital Planning: Introduction to Hospital Planning, principles, hospital plan, MIS in hospital plan, Functional areas: Material planning, product planning, manpower planning, financial planning, marketing planning, peripheral services, health education planning, equipment planning, operational plan and functional plan.

Unit - III		**9 Hrs**
Functional plans for hospital construction: Role of hospital consultant, planning stage, role of architect, working drawings, legal formalities, the hospital site, design considerations, environmental regulations, equipment planning, bed distribution, space requirements, their relationships, construction costs.		
Unit - IV		**9 Hrs**
Building relationships between departments: functional orientation among departments, communication practices, cooperation, and coordination process, building hospital department leadership and managerial capacity		
Unit - V		**9 Hrs**
Safety and Security in the hospital: Safety in the hospital, security and loss prevention programme, fire safety, bomb threat, alarm system. Disaster and disaster preparedness plan in the hospital.		
Total Hours		**45 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Familiarization of hospital planning	PO1, PO6	PSO1	**L1**
2. Understand the various services offered in the hospital	PO1, PO6	PSO1	**L2**
3. Plan and organize services provisions between the departments.	PO3, PO11	PSO1, PSO2	**L4**
4. Coordinate and communicate and bridge the gaps between the departments and able to administer the departments.	PO9, PO10	PSO3	**L3**
5. Understand the importance of safety and security in the hospital	PO6, PO7	PSO1	**L2**

Text Books:

1. Kunders G.D., Hospitals – Facilities Planning and Management, Tata Mc.Graw Hill, New Delhi, fifth edition, 2007.

2. Humera Khan Mohd. Faisal Khan (2005) Management of Super specialty Hospitals, Deep & Deep Publications Pvt. Ltd.

3. Jha S.M., Hospital Management, Himalaya Publishing House, Mumbai, 2007

Reference Books:

1. Longest, B. B., Darr, K. (2014). Managing Health Services Organizations and Systems. United Kingdom: Health Professions Press.

2. Harris, M. G. (2006). Managing Health Services: Concepts and Practice. United Kingdom: Elsevier Australia.

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2					2							2		
CO2	2					2							2		
CO3			3								2		2	2	
CO4									3	2					3
CO5						2	2						2		
CO*	2.0		3.0			2.0	2.0		3.0	2.0	2.0		2.0	2.0	3.0

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT2201K	DISASTER MANAGEMENT	L	T	P	C
		3	0	0	3

Course Description:

The Disaster Management course is designed to provide students with a comprehensive understanding of the principles, strategies, and practices essential for effectively managing disasters. This course explores the various types of natural and human-made disasters, their causes, impacts, and the processes involved in mitigating, preparing for, responding to, and recovering from such events.

Course Objectives:

The main objectives of this course are to:

1. To impart knowledge and concepts of disaster, disaster management and disaster risk reduction.
2. To enhance the students understanding on Hazard Vulnerability and Risk Analysis
3. To develop positive attitude towards practical response to different stages of disaster
4. To management by adopting advance technology and sustainable development.
5. To ensure disaster response skills in assessment, analysis, intervention and evaluation in the Practice of reducing disaster risk.

Unit - I	Concepts of Disaster and Vulnerability	9 Hrs

Hazards and disasters - Concepts, vulnerability and risks; Hazard and disaster type- Natural, Water-related, Pandemic and Human induced hazards and disasters; Causes and impacts of disasters - Impact on natural eco-system; physical, psychological and social impact; Disaster and financial resilience; GIS and Remote Sensing; Disaster vulnerability profile of India - Specific to geographical regions and states (as per regional significance).

Unit - II	Disasters Intervention Practices	9 Hrs

Disaster Management Cycle-Rescue, relief, rehabilitation, reconstruction, prevention, mitigation and preparedness; Disaster risk reduction (ORR) - community based ORR, Institutions concerned with safety, Disaster mitigation and construction techniques as per Indian Standard; Early warning systems; Trauma and Stress management; First-aid and emergency procedures; Awareness generation strategies for the community on safe practices in disaster (as per regional significance)

Unit - III	Disaster Management	9 Hrs

Components of disasters management - Preparedness of rescue & relief, mitigation, rehabilitation & reconstruction; Institutional framework of disaster management in India (NDMA-SDMA-DDMA, NDRF, Civic volunteers, NIDM); Phases of disasters/risk management and post-disaster responses Compensation and insurance

Unit - IV	Applications of remote sensing & GIS in disaster management	9 Hrs

Capacity building for disaster/damage mitigation (structural and non-structural measures); Disaster risk reduction strategies and National Disaster Management Guidelines; Disaster Management Act-2005; Regional issues as per regional requirement/ university can take minimum two topics as per High Powered Committee.

Unit - V	Practical exposure requirements	9 Hrs
Field work/ community visit and Vulnerability Mapping, Safe community planning and implementation, Mock Drill/ Regional issues as per region/university		
Total Hours		**45 Hrs**

Mode of Evaluation: Continuous Assessment Test, Quizzes, Assignments, Multiple choice questions test, field work report, project report.

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
Upon completion of this course, the student will be able to: 1. Define and analysis factors contributing to disasters, threats to development, life and nature	PO1, PO2	PSO1	**L4**
2. Demonstrate, and practice disaster risk reduction activities towards sustainable development	PO6, PO7	PSO1	**L3**
3. Formulate, organize and assess disaster risk reduction	PO3, PO9	PSO1, PSO2	**L5**
4. Plan activities according to the nature of disasters and factors of vulnerabilities	PO3, PO5, PO12	PSO2	**L4**
5. Able to mitigate disaster and educate communities	PO6, PO9	PSO3	**L3**

Text Books:

1. "Disaster Management" by Harsh K. Gupta
2. "Disaster Management: Future Challenges and Opportunities" by Jagbir Singh

Reference Books:

1. Singh, R. (2017), "Disaster Management Guidelines for Earthquakes, Landslides, Avalanches and Tsunami". Horizon Press Publications

2. Taimpo (2016), "Disaster Management and Preparedness" CRC Press Publications

3. Nidhi, G.D. (2014), "Disaster Management Preparedness". CBS Publications Pvt. Ltd.

4. Gupta, A. K., Nair, S.S., Shiraz, A. and Dey, S.(2013), "Flood Disaster Risk Management CBS Publications Pvt. Ltd.

5. Singh, R. (2016), "Disaster Management Guidelines for Natural Disasters" Oxford University Press Pvt. Ltd.

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2											2		
CO2						2	3						2		
CO3			2						2				2	2	
CO4			2		2							2		2	
CO5						3			2						3
CO*	2.0	2.0	2.0		2.0	2.5	3.0		2.0			2.0	2.0	2.0	3.0

Level: 3 - High, 2 - Moderate, 1 – Low

26TAUT2201L	HUMAN VALUES & PROFESSIONAL ETHICS	L	T	P	C
		3	0	0	3

Course Description:

The Human Values and Professional Ethics course aims to explore the fundamental principles that underpin ethical behavior and moral reasoning. This course provides students with an understanding of core human values and ethical frameworks, fostering the development of personal integrity, social responsibility, and professional ethics. Through this course, students will engage with key philosophical theories, contemporary ethical issues, and the application of ethical principles in various contexts.

Course Objectives:

1. Understand the need, guidelines, content, and process for Value Education.
2. Understand the concept of harmony within oneself.
3. Understand the values in human relationships.
4. Understand the interconnectedness and mutual fulfillment among the four orders of nature.
5. Understand the implications of a holistic understanding of harmony on professional ethics.

Unit - I	Introduction – Need, guidelines, content and process for Value Education Value Education	9 Hrs

Understanding the need, basic guidelines, content and process for Value Education; Self-exploration what is it? Its content and process; "Natural acceptance" and Experiential Validation as the mechanism for self-exploration.

Unit - II	Understanding harmony in the human being- Harmony in myself!	9 Hrs

Understanding human being as a coexistence of the sentient I and the material body; Understanding the harmony of I with the body: Sanyam and Swasthya; correct appraisal of physical needs, meaning of prosperity in detail.

Unit - III	Understanding harmony in the Family and Society- Harmony in Human relationship	9 Hrs

Understanding values in human – Human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-trupti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship; Visualizing a universal harmonious order in society-Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha) from family to world family.

Unit - IV	Understanding Harmony in Nature; Coexistence	9 Hrs

Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature; Holistic perception of harmony at all levels of existence.

Unit - V	Implications of the above Holistic understanding of harmony on professional ethics	9 Hrs

Definitiveness of Ethical Human Conduct; Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order; Competence in professional ethics; Ability to utilize the professional competence for augmenting universal human order

Total Hours			**45 Hrs**
Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
After the completion of this course, the learners will be able to: 1. Students will be able to explain the need, guidelines, content, and process for Value Education.	PO8, PO12	PSO3	**L2**
2. Students will demonstrate an understanding of the harmony within oneself, identifying the sentient self and the material body.	PO8, PO12	PSO3	**L2**
3. They will be capable of visualizing and explaining the concept of a universal harmonious order from the family level to the global level.	PO6, PO9	PSO3	**L3**
4. They will recognize and explain the importance of recyclability and self-regulation in nature, and develop a holistic view of harmony at all levels of existence.	PO6, PO7	PSO3	**L4**
5. They will be able to define and advocate for ethical human conduct in their professional lives.	PO6, PO8	PSO3	**L3**
Text Books: 1. "Value Education and Professional Ethics" by R.S. Naagarazan 2. "Human Values and Professional Ethics" by Rishabh Anand			
Reference Books: 1. Mind and Body: Holistic Approach by Dr. V.K. Sharma 2. "Integrative Body-Mind Training" by Yi-Yuan Tang 3. Understanding Harmony in the Family and Society 4. "Human Values and Professional Ethics" by Jayashree Suresh 5. "Ethics in Engineering Practice and Research" by Caroline Whitbeck			

CO-POs/PSOs Mapping

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1								**3**				**2**			**3**
CO2								**2**				**2**			**2**
CO3						**3**			**2**						**3**
CO4						**2**	**2**								**2**
CO5						**2**		**3**							**3**
CO*						**2.3**	**2.0**	**2.7**	**2.0**			**2.0**			**2.6**

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT2201M	HUMAN RIGHTS	L	T	P	C
		3	0	0	3

Course Description:

This course offers a comprehensive introduction to the field of human rights, exploring the historical development, philosophical foundations, and contemporary issues surrounding the protection and promotion of human rights globally. Students will engage with key concepts, major international human rights instruments, and the roles of various actors in the human rights landscape.

Course Objectives:

This course is intended to prepare the students to

1. Know Human Rights, its need importance, and kind of rights
2. Understand the Human Rights of vulnerable groups
3. Identify and analyze key international human rights documents and treaties.
4. Know about the institutions enforcing the Human Rights
5. Understand the violations of Human Rights and the safeguards available to citizens.

Unit - I	**Concept of Human Rights – Indian and International Perspectives**	**5 Hrs**
a. Evolution of Human Rights; b. Definitions under Indian and International documents		
Unit - II	**Broad classification of Human Rights and Relevant Constitutional Provisions**	**11 Hrs**
a. Right to Life, Liberty and Dignity b. Right to Equality c. Right against Exploitation d. Cultural and Educational Rights e. Economic Rights f. Political Rights g. Social Rights		
Unit - III	**Human Rights of Women and Children**	**11 Hrs**
a) Social Practice and Constitutional Safeguards b) Female Foeticide and Infanticide c) Physical assault and harassment d) Domestic violence e) Conditions of Working Women		
Unit - IV	**Institutions for Implementation**	**9 Hrs**
a. Human Rights Commission b. Judiciary		
Unit - V	**Violations and Redressal**	**9 Hrs**
a. Violation by State b. Violation by Individuals c. nuclear weapons, bio war and terrorism d. Safeguards.		
Total Hours		**45 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
After the successful completion of this course the students will be able to 1. Know about Human Rights, its need importance and kind of rights	PO6, PO8	PSO3	**L1**

2. Understand the Human Rights of vulnerable groups	PO6, PO8	PSO3	**L2**
3. Know about the institutions enforcing the Human Rights	PO6, PO8	PSO3	**L1**
4. Understand the violations of Human Rights and the safeguards available to citizens.	PO6, PO8	PSO3	**L2**
5. Develop critical thinking and analytical skills by examining case studies and current events.	PO2, PO12	PSO1	**L4**

Text Books:

1. Human Rights in India: Historical, Social and Political Perspectives (Law in India) Hardcover – Illustrated by Chiranjivi J. Nirmal (Author)
2. History of Human Rights, Narrated by Andrea Giordani

Reference Books:

1. The Universal Declaration of Human Rights- UNO publication
2. Making Sense of Human Rights- by James Nickel.
3. The Idea of Natural Rights- by Brian Tierney.
4. The Law of Peoples- by John Rawls.
5. On Human Rights. - by James Griffin.
6. Human Rights: Contemporary Issues by V.K. Ahuja
7. Human Rights, M Girija, S Chand Edu tech Pvt. Ltd.

CO-POs/PSOs Mapping

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1						**2**		**2**							**2**
CO2						**3**		**2**							**3**
CO3						**2**		**2**							**2**
CO4						**2**		**3**							**3**
CO5		**2**										**2**	**2**		
CO*		**2.0**				**2.3**		**2.3**				**2.0**	**2.0**		**2.5**

Level: 3 - High, 2 - Moderate, 1 – Low

26TAUT2201N	NSS & YOUTH DEVELOPMENT	L	T	P	C
		3	0	0	3

Course Description:

The National Service Scheme (NSS) aims to develop students' personalities through community service and national integration. It encourages students to work towards societal development, fostering a sense of responsibility and civic duty. The program bridges academic learning and real-life experiences, promoting overall personal growth and social awareness among youth.

Course Objectives:

1. To explain the nature, functions and importance of NSS.
2. To explain the role of NSS in the context of youth, community and voluntary service.
3. To develop the necessary communication and soft skills.
4. To appreciate the importance of health, hygiene and sanitation for a healthy nation.
5. To develop the concept and skills of managing environment issues and disaster management.

Unit - I		**9 Hrs**

Youth Development Program in India and Role of Youth Leaders National Youth Policy; Youth Development Program at National Level, State Level, Volunteer Level; Youth centric and youth led organizations Role and Importance of youth leadership, Leadership capability and its development.

Unit - II		**9 Hrs**

Meaning type of leader, Qualities, Traits, Role, Importance of a Good Leader Social, psychologic factors affecting the youth. Life Skills-Self-awareness, Empathy, Effective Communication, Decision Making; Role of Music and Art in Youth Development.

Unit - III		**9 Hrs**

Basic Features of the Indian Constitution consumer protection act right to Information; Child Protection Act, Problems of Aging: Problems Protection of Interests.

Unit - IV		**9 Hrs**

Side effects of modern lifestyle and their countermeasures Diet, exercise, sleep in Indian lifestyle; Collection, Utilization and Camp; Management of Camps; Biography of Swami Vivekananda.

Unit - V		**9 Hrs**

Field Work - Rural visit- campaign- rally- Competitions.

Total Hours		**45 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
After the completion of this course, the learners will be able to: 1. Explain the role and functions of NSS.	PO6, PO9	PSO3	**L2**

2. Appraise the role of NSS volunteers in developing the society as a whole.	PO6, PO9	PSO3	**L5**
3. Develop the necessary skills of effective communication, leadership and healthy living.	PO9, PO10	PSO3	**L3**
4. Develop the necessary skills to mitigate disasters and other environmental challenges.	PO7, PO6	PSO1	**L3**
5. Develop consciousness about personal health and hygiene.	PO6, PO8	PSO3	**L3**

Text Books:

1. Communication Skills by N Rao & R P Das (HPH)
2. Biodiversity, Environment & Disaster Management by Shamna Hussain (Unique Publishers)

Reference Books:

1. NSS Manual published by the Ministry of Youth Affairs & Sports, Govt. of India
2. National Youth Policy Document
3. National Service Scheme - A Youth Volunteers Programme For Under Graduate Students as Per UGC Guidelines by J D S Panwar, A K Jain & B K Rathi (Astral)
4. Environmental Studies by P K Pandey (Mahaveer Publications)

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						**2**			**2**						**2**
CO2						**3**			**2**						**3**
CO3									**3**	**3**					**3**
CO4						**2**	**2**						**2**		
CO5						**2**		**2**							**2**
CO*						**2.3**	**2.0**	**2.0**	**2.3**	**3.0**			**2.0**		**2.5**

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT2201O	COMMUNITY ENGAGEMENT	L	T	P	C
		3	0	0	3

Course Description:

This course provides degree-seeking students with an array of opportunities to engage in an immersive community service-learning experience. It further helps to understand the resources, optimize the recourses in future days, and address the gaps in the communities.

Course Objectives:

Students undergoing this course are expected to:

1. Understand community issues, needs, problems, strengths and recourses
2. Demonstrate the ability to work with a diverse population
3. Formulate more precise personal and professional life goals
4. Demonstrate the ability to communicate effectively and collaborate with institutions and public
5. Demonstrate the ability to take initiative, follow directions, lead, and solve problems

Unit - I	Social Structure	5 Hrs

Concept of Society; Community; Association and Institution; Individual and Society; Social Groups- Meaning, Characteristics and Classification; Social Process; Social Change; Structure and Characteristics of urban, rural and tribal communities.

Unit - II	Social Organisation and Disorganisation	5 Hrs

Social Organisation- meaning, elements and types; Voluntary Associations; Social System- definition, types and roles; Social Control- meaning, aims and process of social control; Social norms, morals and values; Social Disorganisation- definition, causes, control and planning.

Unit - III	Social Problems and Welfare State	8 Hrs

Social Problems- Poverty, Housing, food supply, illiteracy, Prostitution, dowry, child labour, child abuse, delinquency, crime, substance abuse, HIV/AIDS, Covid-19; Venerable Group- elderly, handicapped, minority and another marginal group; Fundamental rights of individual, women and children, NITI Aayog, Ministry of Social Justice & Empowerment, Ministry of Rural Development, Ministry of Tribal Affairs, Ministry of Health & Family Welfare, and Role of Local Bodies for transformation; Corporate Social Responsibility; Social Work. Proposed Field activities: Field visit- Interaction with Local Self Government, Visit of Gram Panchayat & Staff, Socio-Economic Survey (5 hours/ one day).

Unit - IV	Communication Strategies and Community Engagement	18 Hrs

Social Behaviour Change Communication (SBCC); Focused Group Discussion; SWOT analysis; Participatory Learning Action. Proposed Field activities: Meeting, Mobilizing, Transect Walk, Identification of Natural Leaders, Timeline, Mapping, Case Study, Documentation; Outreach- Special Camp Viz., Health Education, Medical Camp, Environment Protection, Sustainability, Technology & Innovation, Nutrition, Swachh Bharat (15 Hours/ 4 days).

Unit - V	Sustainable Development Goals 2023	9 Hrs

Millennium Development Goals; Sustainable Development Goals (SDGs) 2030- 17 Goals; SDG Pyramid; Localizing SDGs; Gram Panchayat Development Plan (GPDP). Proposed Field activities: Mapping the activities with SDG 2030 (6 Hours/ 1 day).			
Total Hours			**45 Hrs**
Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
By the end of the course, students should able to: 1. Understand and apply the concept related to community and social structure.	PO1, PO6	PSO1	**L3**
2. Develop the ability to involve and work with the social system.	PO9, PO6	PSO3	**L3**
3. Understand various social problems emerging in society and solve them.	PO2, PO6	PSO1	**L4**
4. Apply SBCC tools and SWOT analysis.	PO10, PO9	PSO3	**L3**
5. Appreciate Sustainable Development Goals and contribute beyond SDG 2030.	PO6, PO7, PO12	PSO3	**L3**

Text Books:

1. Krishna Kant Singh & Ram Shankar Singh, (2011), Social Work and Community Development.

2. Makara Rumley, (2020), Modern-Day Strategies for Community Engagement: How to Effectively Build Bridges Between People and the Bottom Line.

Reference Books:

1. Hall, B. L., Tandon, R. & Tremblay, C. (2015). Strengthening Community University Research Partnerships: Global Perspectives.

2. http://unescochaircbrsr.org/unesco/pdf/UNESCO%20Book%20Web_with%20BookCovers_Aug202015_FINAL.pdf

3. GUNi (Ed.). (2014). Knowledge, Engagement and Higher Education: Contributing to Social Change (Higher Education in the World 5). Hampshire (UK)/New York (USA): Palgrave Macmillan.

4. UNESCO Chair in Community Based Research & Social Responsibility in Higher Education (2015). Institutionalizing Community University Research Partnerships: A User's Manual. http://unescochair-cbrsr.org/unesco/pdf/CURP_Guidelines.pdf

5. Vallaeys, F. (2014). University Social Responsibility: A Mature and Responsible Definition. In GUNi (Ed.), Knowledge, Engagement and Higher Education: Contributing to Social Change (Higher Education in the World 5) (pp. 88-96).

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2					2							2		
CO2						2			3						2
CO3		2				3							2		
CO4									2	3					3
CO5						2	3					2			2
CO*	2.0	2.0				2.3	3.0		2.5	3.0		2.0	2.0		2.3

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT2201P	FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0-	3

Prerequisite: NIL

Course Description:

Artificial Intelligence (AI) is transforming healthcare, life sciences, education, business, and everyday life by enabling intelligent decision-making, automation, and predictive analytics. This course introduces the fundamental concepts of Artificial Intelligence without requiring prior programming knowledge. Students will explore AI concepts, machine learning, deep learning, generative AI, healthcare applications, ethical issues, and the use of AI-powered tools through case studies and practical demonstrations. The course equips students with AI literacy essential for healthcare professionals and future interdisciplinary careers.

Course Objectives:

1. Understand the fundamental concepts, history, and significance of Artificial Intelligence.
2. Explain how machine learning, deep learning, and generative AI solve real-world problems.
3. Identify AI applications in healthcare, diagnostics, medical imaging, drug discovery, and patient care.
4. Evaluate ethical, legal, privacy, and societal implications of AI in healthcare.
5. Apply AI-powered tools responsibly for healthcare, education, and professional decision-making.

Unit - I	Introduction to Artificial Intelligence	9 Hrs

Introduction to Artificial Intelligence - History and Evolution of AI - AI vs Human Intelligence - Characteristics of Intelligent Systems - Types of AI (Narrow AI, General AI, Super AI) - AI Terminologies - AI Workflow - AI Applications across Various Domains - AI in Everyday Life - Introduction to Data in AI - Role of Data in Intelligent Systems. Case Studies: AI-based Voice Assistants, Smart Healthcare Monitoring Systems.

Unit - II	Machine Learning Fundamentals	9 Hrs

Introduction to Machine Learning - Relationship between AI, Machine Learning and Deep Learning - Types of Machine Learning (Supervised, Unsupervised and Reinforcement Learning) - Training Data and Testing Data - Features and Labels - Classification - Regression - Clustering - Model Training - Prediction - Evaluation Concepts - Introduction to Explainable AI. Case Studies: Disease Risk Prediction, Patient Segmentation using Clustering.

Unit - III	Neural Networks and Generative AI	9 Hrs

Introduction to Neural Networks - Concept of Deep Learning - Image Recognition - Speech Recognition - Natural Language Processing - Computer Vision - Large Language Models (LLMs) - Generative AI - Prompt Engineering Basics - AI Chatbots - AI Assistants - AI for Learning and Research - Limitations of Generative AI - Hallucinations. Case Studies: AI Medical Chatbots, AI-based Medical Image Analysis.

Unit - IV	AI Applications in Healthcare	9 Hrs
Electronic Health Records (EHRs) - Clinical Decision Support Systems - AI in Medical Imaging - AI in Drug Discovery - AI in Precision Medicine - AI in Telemedicine - AI in Wearable Health Devices - AI for Patient Monitoring - Robotics in Healthcare - AI in Public Health - AI for Hospital Management. Case Studies: AI-assisted Radiology, Remote Patient Monitoring using AI.		
Unit - V	**Responsible AI and Future Trends**	**9 Hrs**
Ethics of Artificial Intelligence - Bias and Fairness - Privacy and Data Security - AI Regulations - Explainable AI - Human-AI Collaboration - Responsible Use of AI Tools - AI in Education - AI in Research - Future of Artificial Intelligence - Emerging Trends in AI and Healthcare - Career Opportunities in AI-enabled Healthcare. Suggested Activities: Using ChatGPT for Healthcare Learning, AI-based Image Recognition Demonstration, AI-assisted Literature Search, Prompt Engineering Exercises.		
Total Hours		**45 Hrs**

Course Outcomes:	POs	PSOs	BTL
1. Explain the concepts, evolution, terminology, and applications of Artificial Intelligence.	PO1	PSO1	**2**
2. Differentiate machine learning, deep learning, and generative AI techniques and describe their working principles.	PO1, PO2	PSO1, PSO2	**4**
3. Identify AI applications in healthcare and explain how AI supports diagnosis, treatment, patient monitoring, and healthcare management.	PO2, PO3	PSO1	**3**
4. Evaluate ethical, legal, privacy, fairness, and explainability issues associated with AI in healthcare.	PO8, PO12	PSO3	**5**
5. Demonstrate responsible use of AI-powered tools for healthcare education, research, and professional practice.	PO5, PO9	PSO2, PSO3	**3**

Text Books:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 4th Edition, Pearson, 2021.

2. Kevin Warwick, Artificial Intelligence: The Basics, Routledge, 2023.

3. Bernard Marr, Artificial Intelligence in Practice, Wiley, 2021.

Reference Books:

1. Andreas Holzinger, Artificial Intelligence for Healthcare, Springer.

2. Parag Mahajan and Rajiv Misra, Artificial Intelligence in Healthcare, CRC Press.
3. Melanie Mitchell, Artificial Intelligence: A Guide for Thinking Humans, Penguin.
4. Kai-Fu Lee, AI Superpowers, Houghton Mifflin Harcourt.
5. Eric Topol, Deep Medicine, Basic Books.

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												2		
CO2	2	2											2	1	
CO3		2	2										3		
CO4								3				2			3
CO5					3				2					3	2
CO*	**2.5**	**2**	**2**		**3**	**2**		**3**	2			**2**	**2.25**	**2**	**2**

Level: 3 - High, 2 - Moderate, 1 - Low

26TAUT2201Q	Industry 4.0	L	T	P	C
		3	0	0	3

Prerequisite: Nil.

Course Description:

Industry 4.0 aims at "smart" and connected production systems that are designed to sense, predict, and interact with the physical world, enabling decisions that support production in real-time. In manufacturing, it can increase productivity, energy efficiency, and sustainability. This course further explores the application of Industry 4.0 technologies – including cyber-physical systems, artificial intelligence, machine learning, big data, and cloud computing – to healthcare applications.

Course Objectives:

1. To impart a basic idea of Industry 4.0.
2. To provide students with a good depth of knowledge in designing Industry 4.0 systems for various applications.
3. To learn artificial intelligence and machine learning techniques and tools used in healthcare.
4. To understand big data technology and its applications in healthcare.
5. To learn the design and analysis of Industry 4.0 systems for healthcare applications.

Unit - I	Introduction to Industry 4.0	9 Hrs

Introduction, Historical Context, General Framework, Application Areas, Dissemination of Industry 4.0 and the Disciplines that Contribute to its Development, Artificial Intelligence, The Internet of Things and Industrial Internet of Things, Additive Manufacturing, Robotization and Automation, Current Situation of Industry 4.0.

Unit - II	Cyber Physical Systems	9 Hrs

Introduction to Cyber Physical Systems (CPS), Architecture of CPS – Components, Data Science and Technology for CPS, Emerging Applications of CPS in Different Fields. Case Study: Application of CPS in the Healthcare Domain.

Unit - III	Artificial Intelligence and Machine Learning	9 Hrs

Artificial Intelligence – What and Why? History of AI, Foundations of AI, the AI Environment, Application Domains and Tools. Machine Learning – Introduction, Definition, Types of Machine Learning (Supervised, Unsupervised, Reinforcement Learning), Algorithms for Machine Learning, Problems Solved by Machine Learning, Application Areas of Machine Learning in Healthcare.

Unit - IV	Big Data and Cloud Computing	9 Hrs

What is Big Data, Evolution of Big Data, Sources of Big Data, Characteristics of Big Data (the Vs), Big Data Myths, Data Discovery – Traditional Approach, Big Data Technology Process, Applications of Big Data in Healthcare. Cloud Computing: Need, Definition, Types of Cloud, Types of Services – SaaS, PaaS, IaaS.

Unit - V	Impact of Industry 4.0 on the Healthcare Industry	9 Hrs

An Introduction to How Industry 4.0 is Impacting and Transforming the Healthcare Industry, including Self-Diagnosis Systems for Patients, Real-Time Diagnosis, 3D Printed Organs, and the Internet of Medical Things (IoMT).

Total Hours	45 Hrs

Course Outcomes:	POs	PSOs	Peak BTL
1. Understand the basic concepts of Industry 4.0 and the other related fields.	PO1, PO12	1	2
2. Analyze cyber-physical systems and their architecture, and	PO1, PO2,	1,3	4

design solutions integrating CPS technologies for real-world applications.	PO3, PO5		
3. Understand and apply various artificial intelligence and machine learning tools in the healthcare domain.	PO1, PO2, PO5	**1,2**	**3**
4. Apply big data technology in healthcare applications.	PO1, PO2, PO5	**1,2**	**3**
5. Analyze the impact of Industry 4.0 technologies on the healthcare industry, including self-diagnosis systems, real-time diagnosis, 3D-printed organs and the Internet of Medical Things.	PO1, PO2, PO3, PO6, PO7	**1,2,3**	**4**

Text Books:

1. Jean-Claude André, Industry 4.0, Wiley-ISTE, 2019.
2. Diego Galar Pascual, Pasquale Daponte and Uday Kumar, Handbook of Industry 4.0 and SMART Systems, Taylor and Francis, 2020.

Reference Books:

1. P. Kaliraj and T. Devi, Big Data Applications in Industry 4.0, CRC Press, Taylor & Francis Group, 2022.
2. P. Kaliraj and Devi Thirupathi, Artificial Intelligence: Theory, Models and Applications, Auerbach Publications, CRC Press, Taylor and Francis Group, 2021.
3. Ethem Alpaydin, Introduction to Machine Learning, 3/e, MIT Press, 2014.
4. P. Kaliraj and T. Devi, Industry 4.0 and Education: Transformative Technology and Applications, CRC Press, Taylor & Francis Group, 2022.

Web Links (Online Source):

1. https://nptel.ac.in/courses/106105195
2. https://onlinecourses.nptel.ac.in/noc26_cs38/preview

CO-POs/PSOs Mapping

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 1	PO 12	PSO 1	PSO2	PSO 3
CO1	**3**											**1**	**1**		
CO2	**3**	**2**	**2**		**2**								**2**		**2**
CO3	**2**	**2**			**2**								**2**	**1**	
CO4	**2**	**2**			**2**								**2**	**1**	
CO5	**2**	**3**	**2**			**2**	**1**							**3**	**1**
CO*	**2.4**	**2.2**	**2.0**		**2.0**	**2.0**	**1.0**					**1.0**	**1.8**	**1.7**	**1.5**

Level: 3 – High, 2 – Moderate, 1 – Low

26TAUT2201R	Fundamentals of Cyber Security	L	T	P	C
		3	0	0	3

Prerequisite: Cloud Computing; Network Security.

Course Description:

This course provides a comprehensive exploration of the dynamic field of cybersecurity, encompassing essential concepts, threats, protective measures, and ethical considerations. Students will acquire the knowledge and skills needed to defend against cyber threats, ensure data integrity and availability, and navigate the complex landscape of cybersecurity. The course aims to equip students with a holistic understanding of cybersecurity principles and practices, fostering the ability to safeguard digital assets in an ever-evolving digital world.

Course Objectives:

1. Develop a foundational comprehension of cybersecurity concepts, encompassing threats, vulnerabilities, and protective strategies.
2. Identify and categorize common cyber threats, understand their propagation, and implement effective countermeasures.
3. Explore techniques for ensuring data integrity, authentication, and data availability, while comprehending cryptographic controls.
4. Develop skills to respond to cybersecurity incidents, execute disaster recovery plans, and enhance system availability.
5. Analyse the ethical dimensions of cybersecurity, understand professional responsibilities, and uphold ethical standards in the field.

Unit - I	Cybersecurity Essentials and the Cybersecurity Cube	9 Hrs

The Cybersecurity World, Cyber Criminals versus Cybersecurity Specialists, Common Threats, Spreading Cybersecurity Threats, The Three Dimensions of the Cybersecurity Cube, CIA Triad, States of Data, Cybersecurity Countermeasures, IT Security Management Framework.

Unit - II	Cloud Security Governance and Compliance	9 Hrs

Introduction, Governance, Managing Cloud Security Risk, Compliance, Legal Issues in Cloud, Audit, CSA Tools.

Unit - III	Data Integrity	9 Hrs

Types of Data Integrity Controls, Digital Signatures, Certificates, Database Integrity Enforcement.

Unit - IV	Data Availability and Recovery	9 Hrs

High Availability, Measures to Improve Availability, Incident Response, Disaster Recovery.

Unit - V	Protecting a Cybersecurity Domain	9 Hrs

Defending Systems and Devices, Server Hardening, Network Hardening, Physical and Environmental Security, Cybersecurity Domains, Ethics of Working in Cybersecurity.

Total Hours	45 Hrs

Course Outcomes:	POs	PSOs	Peak BTL
1. Demonstrate an understanding of various cyber threats and vulnerabilities and their potential impact on digital assets.	PO1, PO2	1	2
2. Implement proactive measures to mitigate cyber threats and protect against common attack vectors.	PO1, PO2, PO5	1	3
3. Apply cryptographic techniques to ensure data integrity, authenticity, and confidentiality.	PO1, PO2, PO5	1	3

4. Develop incident response plans and disaster recovery strategies to minimize the impact of cybersecurity incidents.	PO1, PO2, PO5, PO9, PO11	**1,2**	**4**
5. Understand ethical principles and professional responsibilities while making informed decisions in the realm of cybersecurity.	PO6, PO8, PO12	**2**	**2**

Text Books:

1. Mike Chapple, James Michael Stewart and Darril Gibson, CISSP (ISC)2 Certified Information Systems Security Professional Official Study Guide, 9/e.
2. Dr. Erdal Ozkaya, Cybersecurity: The Beginner's Guide, Packt Publishing Limited, 2019.

Reference Books:

1. Charles J. Brooks, Christopher Grow, Philip Craig and Donald Short, Cybersecurity Essentials, 1/e, Sybex.
2. William Stallings, Network Security Essentials, 6/e, Pearson Education, 2018.

Web Links (Online Source):

1. https://nptel.ac.in/courses/106106248
2. https://onlinecourses.nptel.ac.in/noc25_cs142/preview

CO-POs/PSOs Mapping

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 1	PO 12	PSO 1	PSO2	PS O3
CO1	**3**	**2**											**3**		
CO2	**2**	**2**			**2**								**3**		
CO3	**2**	**2**			**3**								**3**		
CO4	**2**	**3**			**2**				**1**		**1**		**3**	**1**	
CO5						**1**		**3**				**1**		**2**	
CO*	**2.2**	**2.2**			**2.3**	**1.0**		**3.0**	**1.0**		**1.0**	**1.0**	**3.0**	**1.5**	

Level: 3 – High, 2 – Moderate, 1 - Low

Semester - IV

26SOTT2902	**Management for Engineers**	L	T	P	C
	(Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	**3**	**0**	**0**	**3**

Prerequisite: Nil.

Course Description:

This course is intended to help students learn the basic concepts and functions of management and its role in the performance of an organization, and to understand various decision-making approaches available for managers to achieve excellence. Learners will gain a broad view of different functional areas of management such as operations, human resources, finance and marketing.

Course Objectives:

1. To introduce fundamental concepts of management that help students understand the intricacies of the management world around them.
2. To introduce the nature of management, covering its basic and critical concepts.
3. To introduce productivity and its measurement, competitiveness, and the decision-making process.
4. To introduce decision-making and the functional areas of management.
5. To introduce various aspects related to entrepreneurship.

Unit - I	**Introduction to Management Theory**	**9 Hrs**

Introduction to Management Theory, Management Defined, Characteristics of Management, Management as an Art/Profession, Systems Approach to Management, Task and Responsibilities of a Professional Manager, Levels of Management and Skills Required.

Unit - II	**Management and Organization**	**9 Hrs**

Management Process, Planning Types, Mission, Goals, Strategy, Programmes, Procedures, Organising, Principles of Organisation, Delegation, Span of Control, Organisation Structures, Directing, Leadership, Motivation, Controlling.

Unit - III	**Productivity and Decision Making**	**9 Hrs**

Concept of Productivity and its Measurement; Competitiveness; Decision-Making Process; Decision Making under Certainty, Risk and Uncertainty; Decision Trees; Models of Decision Making.

Unit - IV	**Functional Areas of Management**	**9 Hrs**

Introduction to Functional Areas of Management, Operations Management, Human Resources Management, Marketing Management, Financial Management.

Unit - V	**Entrepreneurship**	**9 Hrs**

Introduction to Entrepreneurship, Entrepreneurship in India, Role of Government, Business Plans, Corporate Social Responsibility, Patents and Intellectual Property Rights.

Total Hours	**45 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Understand the basic concepts and principles of management.	PO1, PO6	**1**	**2**
2. Understand the functions and structure of organizations.	PO1, PO9, PO10	**1**	**2**
3. Apply productivity measurement techniques and decision-making concepts in management.	PO1, PO2, PO11	**1,2**	**3**
4. Analyze the functional areas of management, including operations, human resources, marketing and finance.	PO1, PO2, PO9, PO11	**1,2**	**4**
5. Understand the fundamentals of entrepreneurship and its role in business development.	PO1, PO6, PO8, PO11	**2,3**	**2**

Text Books:

1. H. Koontz, and H. Weihrich, Essentials of Management: An International Perspective, 8/e, McGraw-Hill, 2009.
2. Robbins, S. P., Judge, T., Vohra, N., Organizational Behavior, Pearson, 2013.

Reference Books:

1. P. Kotler, K. L. Keller, A. Koshy, and M. Jha, Marketing Management: A South Asian Perspective, 14/e, Pearson, 2012.
2. M. Y. Khan, and P. K. Jain, Financial Management, Tata McGraw Hill, 2008.
3. R. D. Hisrich, and M. P. Peters, Entrepreneurship: Strategy, Developing, and Managing a New Enterprise, 4/e, McGraw-Hill Education, 1997.
4. J. Sumanth, Productivity Engineering and Management, McGraw-Hill Education, 1985.
5. K. Ashwathappa, Human Resources and Personnel Management, TMH, 3/e, 2005.
6. R. B. Chase, Ravi Shankar and F. R. Jacobs, Operations and Supply Chain Management, 14/e, McGraw Hill Education (India), 2015.
7. P. C. Tripathi and P. N. Reddy, Principles of Management, TMH, 4/e, 2008.

Web Links (Online Source):

1. https://nptel.ac.in/courses/110107150
2. https://onlinecourses.nptel.ac.in/noc24_mg47/preview

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3					1								1	
CO2	3								1	1				1	
CO3	2	2									1			1	1
CO4	2	3							1		2			1	1
CO5	2					2		1			2			2	2
CO*	2.4	2.5				1.5		1.0	1.0	1.0	1.7			1.2	1.3

Level: 3 – High, 2 – Moderate, 1 - Low

26SOTT2303	**Computer Organisation and Architecture** (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		3	0	0	3

Prerequisite: Digital Logic Design.

Course Description:

Computer Organization and Architecture is a core course in computing and engineering programs that provides students with a comprehensive understanding of the design, organization, and performance of modern computer systems. The course focuses on the architecture of uniprocessor systems, instruction execution, CPU organization, arithmetic operations, memory hierarchy, cache memory, and input/output organization. Students study the design principles of high-performance microprocessors, vector processors, and memory systems to understand techniques for improving system performance. The course also covers cache optimization, multiprogramming concepts, and advanced I/O mechanisms, including programmed I/O, interrupt-driven I/O, and Direct Memory Access (DMA). By integrating fundamental and intermediate architectural concepts, the course equips students with the knowledge and analytical skills required to evaluate and design efficient computer systems.

Course Objectives:

1. To provide an understanding of the basic structure, digital computer operations and processor clock.
2. To illustrate the working of internal processor components, addressing modes and the techniques used for generating control signals during instruction execution.
3. To demonstrate processor and I/O communication techniques, along with arithmetic algorithms such as Booth's multiplication and restoring/non-restoring division for efficient data handling.
4. To investigate the internal organization of memory chips and the impact of cache on processor performance.
5. To discuss the classic five-stage instruction pipeline and its role in improving processor performance.

Unit - I	**Introduction to Computer Systems**	**9 Hrs**

Overview of Organization and Architecture – Functional Components of a Computer, Organization of the Von Neumann Machine and Harvard Architecture. Basic Operations Concept and Performance: Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement. Registers and Register Bank: Processor Registers, Register Types, Register Organization, Register Transfer Operations, Register Bank Organization.

Unit - II	**Machine Instructions and Programs**	**9 Hrs**

Memory Locations and Addresses, Memory Operations, Instruction Formats, Instructions and Instruction Sequencing: Register Transfer Notation. Basic Processing Unit: Fundamental Concepts: Addressing Modes, Performing ALU Operations, Fetching and Storing Data in Memory. Execution of a Complete Instruction, Branch Instructions; Multiple Bus Organization. Difference between CISC and RISC Architectures.

Unit - III	**I/O Organization**	**9 Hrs**

Access of I/O Devices, Basics of Interrupts, Direct Memory Access, Bus Arbitration, Buses – Synchronous and Asynchronous Bus. Computer Arithmetic: Representation of Fixed and Floating Point Numbers, Signed Operand Multiplication: Booth Algorithm; Fast Multiplication: Bit-Pair Recoding of Multipliers, Integer Division, and Representation of Non-numeric Data (Character Codes).

Unit - IV	**The Memory System**	**9 Hrs**

Memory Systems Hierarchy – Main Memory Organization – Types of Main Memory – Memory Interleaving and its Characteristics and Performance. Cache Memories: Address Mapping – Line Size – Replacement Policies – Virtual Memory Systems.

Unit - V	**Pipelining**	**9 Hrs**

Basic and Intermediate Concepts: What is Pipelining?, The Classic Five-Stage Pipeline for a RISC

Processor, Pipeline Hazards. Device Subsystems: External – RAID Levels – I/O Performance. Performance Enhancements: Flynn's Taxonomy of Parallel Computer Architectures – SISD, SIMD, MISD, and MIMD.			
Total Hours			**45 Hrs**
Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Recognize the functionalities of computer architecture and its components.	PO1, PO2, PO7,PO12	**1,2,3**	**2**
2. Discuss the internal functional units of a processor to execute instructions and the mechanism for generating control signals.	PO1, PO2, PO12	**1,2,3**	**2**
3. Apply processor and I/O communication techniques along with arithmetic algorithms such as Booth's Multiplication and restoring/non-restoring division for efficient data handling in computer systems.	PO1, PO2, PO4, PO5	**1,2,3**	**3**
4. Apply the concepts of memory management for analysis of system performance.	PO1, PO2, PO3, PO12	**1,2,3**	**3**
5. Understand the classic five-stage pipeline and its role in improving processor performance.	PO1, PO2, PO6, PO10	**1,2,3**	**2**

Text Books:

1. M. Morris Mano, Computer System Architecture, 3/e, PHI, India, 2006.
2. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, Computer Organization, 5/e, McGraw Hill, New Delhi, India, 2010.

Reference Books:

1. William Stallings, Computer Organization and Architecture: Designing for Performance, 8/e, Prentice Hall, New Jersey, 2010.
2. Andrew S. Tanenbaum, Structured Computer Organization, 5/e, Pearson Education Inc, New Jersey, 2006.
3. Sivarama P. Dandamudi, Fundamentals of Computer Organization and Design, Springer International Edition, USA, 2003.
4. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, 5/e, Morgan Kaufmann, 2013.

Web Links (Online Source):

1. https://nptel.ac.in/courses/106102157
2. https://nptel.ac.in/courses/106105163
3. https://nptel.ac.in/courses/106106166

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1					1					2	1	2	1
CO2	3	1										1	1	2	1
CO3	3	2		1	2								2	2	2
CO4	3	2	1									1	1	1	2
CO5	3	2				1				1			1	1	2
CO*	3.0	1.6	1.0	1.0	2.0	1.0	1.0			1.0		1.3	1.2	1.6	1.6

Level: 3 – High, 2 – Moderate, 1 - Low

26SOTT2304	Database Management Systems (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		3	1	0	4

Prerequisite: Data Structures.

Course Description:

This course introduces students to the fundamental concepts, design principles, and practical implementation of Database Management Systems (DBMS). It covers database architecture, Entity-Relationship (ER) modeling, the relational data model, relational algebra and calculus, and Structured Query Language (SQL) along with procedural extensions using PL/SQL, including functions, stored procedures, triggers, cursors, and exception handling. The course further develops student understanding of views and indexes for industry-oriented, real-world query design, database normalization techniques, transaction management, concurrency control, and recovery mechanisms. It also introduces modern database systems and their industry applications, including foundational concepts of database security, database performance and query optimization, and cloud databases, along with an introduction to NoSQL databases and MongoDB – covering documents, collections, CRUD operations, and BSON. The course concludes with industry case studies such as the Netflix recommendation system, Hospital Management System and Electronic Health Records (EHR), and UPI payment systems (Google Pay/PhonePe), helping students connect core database theory with real-world, large-scale application design.

Course Objectives:

1. To understand the fundamental concepts, architecture, and components of Database Management Systems and Entity-Relationship modeling.
2. To apply the relational database model, relational algebra, and relational calculus to design and query databases.
3. To develop proficiency in SQL and PL/SQL programming, including functions, stored procedures, triggers, cursors, and exception handling, and to design views and indexes for efficient, industry-oriented query design.
4. To apply normalization techniques to eliminate data redundancy and to understand transaction processing, concurrency control, and recovery techniques.
5. To gain foundational knowledge of database security, database performance and query optimization, and cloud databases, along with an introduction to NoSQL databases including MongoDB, and to analyze real-world industry case studies to appreciate how database concepts are applied in large-scale, modern software systems.

Unit - I	Database Fundamentals and ER Modeling	12 Hrs

Database Concepts, Evolution of Database Systems, File System vs Database Management System (DBMS), Characteristics of DBMS, Advantages and Limitations of DBMS, Three-Level Architecture of DBMS, Components of DBMS Architecture, Database Users and Their Roles, Types of Data Models, Entity-Relationship (ER) Model, Entities, Attributes, Relationship Sets, Constraints in ER Modeling, Weak Entity Sets, Strong Entity Sets, ER Diagram Design and Notation, Converting Real-World Scenarios into ER Diagrams. Case Studies: ERD based on a hospital management system, ERD based on a student progress monitoring system.

Unit - II	Relational Database Model	12 Hrs

Introduction to the Relational Database Model, Concepts of Relations, Tuples and Attributes, Types of Keys (Super Key, Candidate Key, Primary Key, Alternate Key and Foreign Key), Integrity Constraints, Relational Algebra Operations (Selection, Projection, Union, Intersection, Set Difference, Cartesian Product, Joins and Division), Tuple Relational Calculus, Domain Relational Calculus, Formulating Queries using Relational Algebra and Relational Calculus, Practical Query Examples and Applications.

Unit - III	SQL and PL/SQL	12 Hrs

Introduction to Structured Query Language (SQL), SQL Data Types, Database and Table Creation, Constraints (Primary Key, Foreign Key, Unique, Check and Not Null), Data Definition Language (DDL),

Data Manipulation Language (DML), Data Query Language (DQL), Data Control Language (DCL), Transaction Control Language (TCL), SQL Operators, Aggregate Functions, Grouping and Sorting Data, Joins, Subqueries, Views, Indexes, Introduction to PL/SQL, Control Structures, Functions, Stored Procedures, Triggers, Cursors, Exception Handling and Industry-Oriented SQL Query Design.		
Unit - IV	**Normalization and Transaction Processing**	**12 Hrs**
Schema Refinement, Decomposition, Functional Dependencies, Attribute Closure, Database Normalization, First Normal Form (1NF), Second Normal Form (2NF), Third Normal Form (3NF), Boyce-Codd Normal Form (BCNF), Multivalued Dependencies, Fourth Normal Form (4NF), Join Dependencies, Fifth Normal Form (5NF), Transaction Concepts, ACID Properties, Transaction States, Serializability, Concurrency Control, Lock-Based Protocols, RAID, Database Recovery Techniques, Log-Based Recovery and Recovery with Concurrent Transactions.		
Unit - V	**Modern Database Systems & Industry Applications**	**12 Hrs**
Introduction to Database Security, User Authentication and Authorization, Introduction to Database Performance and Query Optimization Techniques, Introduction to Cloud Databases and Cloud-Based Database Services, Introduction to NoSQL Databases, SQL vs NoSQL Databases, MongoDB Architecture, Documents, Collections, BSON Data Format, CRUD Operations in MongoDB, Introduction to Database Applications in Industry. Case Studies: Hospital Management System and Electronic Health Records (EHR), Netflix Recommendation System, and UPI Payment Systems (Google Pay/PhonePe).		
Total Hours		**60 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Describe the fundamental concepts, architecture, and components of Database Management Systems, and design Entity-Relationship models for real-world scenarios.	PO1, PO2, PO3, PO12	**1,2,3**	**3**
2. Apply the relational model, relational algebra, and relational calculus to design and query relational databases.	PO1, PO2, PO3	**1,2,3**	**3**
3. Write and apply SQL and PL/SQL constructs, including functions, stored procedures, triggers, cursors, and exception handling, and design views and indexes to support efficient, industry-oriented query design.	PO1, PO2, PO3	**1,2,3**	**4**
4. Apply normalization techniques to design redundancy-free database schemas, and analyze transaction processing, concurrency control, and recovery mechanisms.	PO1, PO2, PO3	**1,2,3**	**4**
5. Explain the foundational concepts of database security, database performance and query optimization, and cloud databases; describe the basic principles of NoSQL databases and MongoDB (documents, collections, CRUD operations, and BSON); and relate database concepts to real-world industry case studies such as the Netflix recommendation system, Hospital Management System/EHR, and UPI payment systems.	PO1, PO2, PO3, PO4, PO12	**1,2,3**	**3**

Text Books:

1. Silberschatz, A., Korth, H. F., and Sudarshan, S., Database System Concepts, 7/e, McGraw-Hill Education, 2020.

2. Elmasri, R., and Navathe, S. B., Fundamentals of Database Systems, 7/e, Pearson Education, 2021.
3. Ramakrishnan, R., and Gehrke, J., Database Management Systems, 3/e, McGraw-Hill Education, 2014.
4. Chodorow, K., MongoDB: The Definitive Guide, 2/e, O'Reilly Media, 2013. (Added for NoSQL/MongoDB coverage.)

Reference Books:

1. Date, C. J., An Introduction to Database Systems, 8/e, Pearson Education, 2003.
2. Connolly, T., and Begg, C., Database Systems: A Practical Approach to Design, Implementation, and Management, 6/e, Pearson Education, 2014.
3. Sadalage, P. J., and Fowler, M., NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Addison-Wesley, 2012.
4. Martin Kleppmann, Designing Data-Intensive Applications, O'Reilly Media, 2017.

Web Links (Online Source):

1. https://nptel.ac.in/courses/106106220
2. https://nptel.ac.in/courses/106105175

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2									1	3	1	1
CO2	2	3	3										3	1	1
CO3	3	2	2										3	1	2
CO4	2	3	3										3	1	2
CO5	2	3	3	2								1	3	2	3
CO*	2.4	2.8	2.6	2.0								1.0	3.0	1.2	1.8

Level: 3 – High, 2 – Moderate, 1 - Low

26SOTT2305	OPERATING SYSTEMS (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		3	1	0	4

Course Description:

This course examines the important problems in operating system design and implementation. This discussion will cover the trade-offs that can be made between performance and functionality during the design and implementation of an operating system. Particular emphasis will be given to three major OS subsystems: process management memory management (segmentation, paging, swapping), and file systems; and on operating system support for distributed systems.

Course Objectives:

1. To introduce the operating system concepts, designs and provide skills required to implement the services.
2. To describe the trade-offs between conflicting objectives in large scale system design.
3. To develop the knowledge for application of the various design issues and services.
4. To familiarize Students with the important storage mechanisms in operating systems.
5. To Apply various schemes for achieving system protection and security

Unit - I	Introduction to OS	12 Hrs

Functionality of OS, OS design issues, Structuring methods (monolithic, layered, modular, micro-kernel models), Abstractions, processes, Operating System Structures,
Booting Process, Kernel Data Structures. OS Principles: System calls, System/Application Call Interface – Protection: User/Kernel modes – Interrupts.

Unit - II	Process and Concurrency	12 Hrs

Process Concept, Process Scheduling, Scheduling Criteria-CPU Scheduling Algorithms. Operations on Processes, Inter-Process Communication (IPC), Threads Overview, Multithreading Models, Thread Libraries, Threading Issues, Thread Scheduling, Critical Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classical Synchronization Problems.

Unit - III	Deadlocks and Main Memory Management	12 Hrs

Deadlock System Model, Deadlock Characterization, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlocks.
Main memory management, Memory allocation strategies, Virtual memory: Hardware support for virtual memory (caching, TLB) – Paging - Segmentation - Demand Paging - Page Faults – Page Replacement -Thrashing.

Unit - IV	Storage Management and File systems	12 Hrs

Disk structure and attachment – Disk scheduling algorithms, seek time, rotational latency based, File System Interface, Filé Concept, Directory Structure, File Allocation Methods, Free Space Management, File Protection.

Unit - V	Operating System Protection, Security and Contemporary Trends	12 Hrs

System Security: System Threats and Security, Policy vs. Mechanism, Authentication vs. Access Control. System Protection: Access Matrix, Capability-Based Systems, Operating System Performance and Scalability, Contemporary Trends: Virtualization, Mobile Operating Systems, Cloud and Distributed Operating Systems (Overview), Recent Trends in Operating Systems.

Total Hours	60 Hrs

Course Outcomes:	Pos	PSOs	Peak

			BTL
1. To interpret the evolution of OS functionality, structures and layers. System calls and finds the stages of various process states.	PO1, PO2	PSO1	BTL 2
2. To design a model scheduling algorithm to compute various scheduling criteria.	PO1, PO2, PO3	PSO1, PSO2	BTL 3
3. To apply and Analyse communication between inter process and synchronization techniques. Implement page replacement algorithms, memory management problems and segmentation.	PO1, PO2, PO3, PO4	PSO1, PSO2	BTL 4
4. To differentiate the file systems for applying different allocation and access techniques.	PO1, PO2, PO3	PSO1, PSO2	BTL 4
5. Develop the security mechanism for system protection	PO1, PO2, PO3, PO5	PSO2, PSO3	BTL 6

Text Books:

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne-Operating System Concepts, Wiley (2018).
2. Stallings (2006), Operating Systems, Internals and Design Principles, 5th edition, Pearson Education, India.

Reference Books:

1. Ramez Elmasri, A. Gil Carrick, David Levine, Operating Systems, A Spiral Approach-McGraw H ill Higher Education (2010).
2. Remzi H. Arpaci-Dusseau, Andrea C. Arpaci-Dusseau, Operating Systems, Three Easy Pieces, Arpaci-Dusseau Books, Inc (2015).
3. Andrew S. Tanenbaum, Modern Operating Systems, Pearson, 4th Edition (2016).
4. William Stallings, Operating Systems: Internals and Design Principles, Pearson, 9th Edition (2018).

Web Links (Online Source):

1. https://nptel.ac.in/courses/106105214 *(NPTEL – Operating Systems)*
2. https://pages.cs.wisc.edu/~remzi/OSTEP/ *(Operating Systems: Three Easy Pieces – Free Online Book)*

CO-POs/PSOs Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2											3		
CO2	3	3	2										3	2	
CO3	3	3	3	2									3	3	
CO4	3	2	2										3	2	
CO5	3	2	3		2									3	3
CO*	3	2.4	2.5	2	2								3	2.5	3

26SOTJ2302	**Artificial Intelligence and Machine Learning** **Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)**	L	T	P	C
		3	0	2	4

Course Description:

AIML course introduces the fundamental concepts and techniques of Artificial Intelligence and Machine Learning. It covers AI problem-solving methods, search strategies, supervised and unsupervised learning algorithms, and basic reinforcement learning. Students learn to evaluate machine learning models using appropriate classification and regression metrics. The course also develops an understanding of real-world AI and ML problems through suitable case studies.

Course Objectives:

1. To introduce the fundamental concepts, characteristics and applications of Artificial Intelligence and Machine Learning.
2. To develop an understanding of AI problem formulation and basic uninformed and heuristic search techniques.
3. To explain supervised machine learning algorithms used for regression and classification problems.
4. To familiarize students with classification and regression model evaluation metrics and validation techniques.
5. To introduce unsupervised learning techniques and the fundamental concepts of reinforcement learning through suitable case studies.

Unit - I	**Introduction to Artificial Intelligence and Machine Learning**	**9 Hrs**

Introduction to Artificial Intelligence, Need for AI, Goals of AI, History of AI, Characteristics of Intelligent Systems, AI Applications. Introduction to Machine Learning, Need for Machine Learning, Difference between AI and ML, Types of Machine Learning: Supervised Learning, Unsupervised Learning and Reinforcement Learning. Basic Steps in Machine Learning: Data Collection, Data Preprocessing, Training, Testing and Prediction.

Unit - II	**AI Problem Solving and Search Techniques**	**9 Hrs**

Problem Solving in AI, Problem Formulation, State Space Representation, Production System. Search Techniques: Breadth First Search, Depth First Search, Uniform Cost Search. Heuristic Search, Greedy Best First Search, A* Algorithm. Simple Examples: Water Jug Problem, 8-Puzzle Problem and Path Finding Problem.

Case Study: Develop a Smart Route Navigation System using BFS and A* Search algorithms for finding the shortest path between two locations on a grid map. Compare both algorithms based on path length, execution time, and number of nodes expanded.

Unit - III	**Supervised Machine Learning**	**9 Hrs**

Introduction to supervised learning, training data and testing data, features and labels. Regression and classification. Simple Linear Regression, Logistic Regression, k-Nearest Neighbour algorithm, Decision Tree algorithm, Support Vector Machine, Naive Bayes classifier.

Case study: Develop a Disease Prediction System (Diabetes/Heart Disease) System using supervised learning algorithms.

Unit - IV	**Machine Learning Model Evaluation Metrics**	**9 Hrs**

Need for model evaluation. Training, Validation and testing datasets, Classification Metrics: Confusion matrix, accuracy, precision, recall, sensitivity, specificity, F1-score, ROC, AUC. Regression Metrics: Mean Absolute Error, Mean Squared Error, Root Mean Squared Error, Overfitting and underfitting. Basics of Cross-validation.

Case Study: Evaluation and comparison of machine learning models for student performance prediction.

Unit - V	Unsupervised Machine Learning and Reinforcement Learning	9 Hrs

Introduction To Unsupervised Learning, Clustering and Grouping of Data. K-Means Clustering, Hierarchical Clustering, Distance Measures. Basics Of Dimensionality Reduction and Principal Component Analysis. Introduction To Association Rule Mining, Apriori Algorithm, Support and Confidence. Introduction To Reinforcement Learning, Q-Learning, Basic Concepts of Policy and Reward.

Case Study: Customer Segmentation Using K-Means Clustering and Optimal Path Identification Using Q-Learning.

Total Hours	**45 Hrs**

List of Experiments:

Exp. No	Title of the Experiment	COs
1	Implement Breadth First Search and Depth First Search for graph traversal and path finding	CO1
2	Implement Uniform Cost Search and Greedy Best-First Search for a route-finding problem and compare the paths obtained.	CO1
3	Implement the A* search algorithm to solve the 8-puzzle problem using an appropriate heuristic function.	CO2
4	Represent and solve the Water Jug problem using state-space representation and production rules.	CO2
5	Perform data loading, exploratory analysis, handling of missing values, encoding, feature scaling and train–test splitting on UCI Automobile dataset.	CO3
6	Build a Simple Linear Regression model and evaluate it using MAE, MSE, RMSE on UCI Auto MPG Dataset.	CO3, CO4
7	Build a Logistic Regression classifier on Breast Cancer Wisconsin Diagnostic Dataset and evaluate it using confusion matrix, accuracy, precision, recall, F1-score, ROC curve and AUC.	CO3, CO4
8	Implement and compare k-Nearest Neighbour and Support Vector Machine classifiers on UCI Iris Dataset.	CO3, CO4
9	Implement Decision Tree and Naive Bayes classifiers; compare their performance using hold-out validation and k-fold cross-validation on UCI Wine Dataset.	CO3, CO4
10	Perform customer or data-point segmentation using k-Means and Hierarchical Clustering and visualize the resulting clusters on UCI online Retail Dataset.	CO5
11	Apply Principal Component Analysis for dimensionality reduction and implement Apriori association-rule mining using support, confidence and lift.	CO5
12	Implement Q-Learning for a simple grid-world or path-finding environment and display the learned Q-table and optimal policy.	CO5
Mini Project	Implementation and evaluation of Black Box and White Box models in the Artificial Intelligence and Machine Learning.	

Course Outcomes:	POs	PSOs	Peak BTL
1. Understand the fundamental concepts of Artificial Intelligence and Machine Learning, including types of learning and the basic ML workflow.	PO1, PO12	1	2
2. Apply AI problem-solving techniques and search strategies to solve simple search problems.	PO1, PO2	1,3	3

3. Apply supervised learning algorithms such as regression, k-NN, Decision Tree and Naive Bayes for prediction and classification tasks.	PO1, PO2, PO5	**1,3**	**3**
4. Apply unsupervised learning techniques such as clustering, dimensionality reduction and association rule mining to group and analyze data.	PO1, PO2, PO5	**1,3**	**3**
5. Evaluate machine learning models using standard performance metrics, and analyze real-world applications and ethical issues in AI.	PO1, PO2, PO5, PO6, PO8, PO12	**1,2,3**	**4**

Text Books:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson.
2. Tom M. Mitchell, Machine Learning, McGraw Hill.
3. Ethem Alpaydin, Introduction to Machine Learning, MIT Press.

Reference Books:

1. Saikat Dutt, Subramanian Chandramouli and Amit Kumar Das, Machine Learning, Pearson.
2. Elaine Rich, Kevin Knight and Shivashankar B. Nair, Artificial Intelligence, McGraw Hill.
3. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras and TensorFlow, O'Reilly.

Web Links (Online Source):

1. https://nptel.ac.in/courses/106106126
2. https://nptel.ac.in/courses/106105152

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**											**1**	**2**		
CO2	**3**	**2**											**2**		**1**
CO3	**3**	**2**			**2**								**3**		**2**
CO4	**3**	**2**			**2**								**3**		**2**
CO5	**2**	**3**			**2**	**1**		**2**				**1**	**2**	**3**	**1**
CO*	**2.8**	**2.2**			**2.0**	**1.0**		**2.0**				**1.0**	**2.4**	**3.0**	**1.5**

Level: 3 – High, 2 – Moderate, 1 – Low

26BTAT2501	Foundations of Data Science	L	T	P	C
		3	0	0	3

Course Description:

Data Science has emerged as one of the most transformative disciplines in computing, enabling organizations to derive meaningful insights from structured and unstructured data. This course introduces students to the complete data science lifecycle, including data acquisition, preprocessing, exploratory data analysis, visualization, statistical foundations, probability, feature engineering, and introductory predictive analytics. Students will learn how to collect, clean, analyse, visualise, and interpret data using Python and widely adopted data science libraries. The course emphasizes practical problem-solving through real-world datasets from healthcare, finance, education, agriculture, smart cities, and business analytics. Ethical considerations, data privacy, reproducible research, and responsible AI practices are also introduced to prepare students for advanced courses in machine learning, artificial intelligence, and big data analytics.

Course Objectives:

Upon successful completion of the course, students will be able to:

1. Understand the principles, workflow, and applications of Data Science.
2. Apply statistical and probabilistic concepts for analyzing real-world datasets.
3. Perform data acquisition, cleaning, preprocessing, transformation, and exploratory data analysis.
4. Visualize data effectively using appropriate graphical techniques and Python libraries.
5. Build simple predictive models and interpret analytical results using industry-standard tools.

Unit - I	Introduction to Data Science and Python Libraries	9 Hrs

Introduction to Data Science - Evolution of Data Science -Data Science Lifecycle -Types of Data - Sources of Data: Structured, Semi-Structured and Unstructured Data- Data Science Process Models - Data Science Applications - Roles of Data Scientist -Data Science Ethics -Data Privacy -Open Data Sources - Python Environment for Data Science -Jupyter Notebook -Google Colab. Python Libraries for Data Science.

Case Studies: COVID-19 Data Analysis, Netflix Recommendation Dataset Exploration

Unit - II	Data Collection and Preprocessing	9 Hrs

Data Acquisition - CSV, Excel, JSON, APIs -Web Data Collection -Data Integration -Data Cleaning -Missing Value Treatment -Duplicate Detection -Outlier Detection -Data Transformation -Feature Scaling - Normalization -Standardization -Encoding Categorical Variables -Feature Selection -Train-Test Split

Case Studies: Student Performance Dataset and House Price Dataset

Unit - III	Exploratory Data Analysis and Visualization	9 Hrs

Descriptive Statistics, Mean, Median, Mode, Variance, Standard Deviation, Quartiles, Percentiles, Correlation, Covariance, Exploratory Data Analysis (EDA), Data Profiling, Histograms, Scatter Plots, Box Plots, Pie Charts, Heatmaps, Pair Plots, Time Series Visualization, Dashboard Fundamentals,

Case Studies: Sales Analytics and Customer Churn Analysis

Unit - IV	Statistical Foundations and Predictive Analytics	9 Hrs

Probability Basics- Random Variables - Probability Distributions - Bayes Theorem - Sampling - Central Limit Theorem -Confidence Intervals -Hypothesis Testing -Correlation vs Causation -Regression Basics - Classification Concepts -Clustering Concepts -Model Evaluation -Cross Validation -Bias-Variance Tradeoff.

Case Studies: Diabetes Prediction and Loan Approval Prediction

Unit - V	Database and Deployment	9 Hrs

End-to-End Data Science Workflow -Data Storytelling -Data Science in Healthcare -Financial Analytics - Business Intelligence -Agriculture Analytics -IoT Data Analytics -Social Media Analytics -Recommendation Systems -Introduction to Big Data -Cloud-based Data Science -MLOps Overview -Generative AI for Data Science -Responsible AI -Data Governance

Case Studies: Dashboard creation for Retail Demand Forecasting and Weather Analytics Dashboard.

Total Hours			**45 Hrs**
Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Explain the complete data science lifecycle, ethical principles, and real-world applications.	PO1, PO2, PO3, PO4, PO5		**2**
2. Acquire, clean, preprocess, and transform datasets using Python and data science libraries.	PO1, PO2, PO3, PO4, PO5		**3**
3. Perform exploratory data analysis and visualize datasets to extract meaningful insights.	PO1, PO2, PO3, PO4, PO5		**4**
4. Apply statistical techniques and introductory predictive analytics to solve real-world problems.	PO1, PO2, PO3, PO4, PO5		**5**
5. Design and implement end-to-end data science solutions using appropriate analytical tools and communicate insights effectively.	PO1, PO2, PO3, PO4, PO5		**6**

Text Books:

1. Joel Grus, **Data Science from Scratch**, 2nd Edition, O'Reilly Media, 2019.
2. Wes McKinney, **Python for Data Analysis**, 3rd Edition, O'Reilly Media, 2022

Reference Books:

1. Foster Provost and Tom Fawcett, **Data Science for Business**, O'Reilly Media, 2013.
2. Trevor Hastie, Robert Tibshirani and Jerome Friedman, **The Elements of Statistical Learning**, Springer.
3. Cathy O'Neil and Rachel Schutt, **Doing Data Science**, O'Reilly Media, 2013.
4. Jake VanderPlas, **Python Data Science Handbook**, O'Reilly Media, 2023.
5. Gareth James et al., **An Introduction to Statistical Learning**, Springer, 2023.

Web Links (Online Source):

1. UC Berkeley – Data 8: Foundations of Data Science https://data8.org/
2. Computational and Inferential Thinking: The Foundations of Data Science (Free Online Textbook) https://inferentialthinking.com/
3. Cambridge University Press – Foundations of Data Science (Blum, Hopcroft & Kannan) https://www.cambridge.org/core/books/foundations-of-data-science/6A43CE830DE83BED6CC5171E62B0AA9E
4. Google Books – Foundations of Data Science https://books.google.com/books/about/Foundations_of_Data_Science.html?id=koHCDwAAQBAJUniversity of Cambridge – Course: Foundations of Data Science https://www.cl.cam.ac.uk/teaching/1920/DataSci/

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	2								3	2	2
CO2	3	3	2	2	3								3	3	2
CO3	3	3	3	3	3								3	3	3
CO4	3	3	3	3	3								3	3	3
CO5	3	3	3	3	3								3	3	3
CO*	3	2.8	2.6	2.6	2.8								3	2.8	2.6

26SOTT2903	Indian Knowledge System (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		3	0	0	0

Prerequisite: Nil.

Course Description:

This course introduces students to the vast intellectual heritage of India spanning philosophy, mathematics, astronomy, medicine, art, architecture, literature, and sustainable practices. It fosters an appreciation of India's contributions to global knowledge and encourages students to integrate traditional wisdom with modern scientific and engineering practice, in line with the objectives of the National Education Policy (NEP) 2020.

Course Objectives:

1. To introduce students to the philosophical foundations and diverse schools of thought in the Indian Knowledge System.
2. To create awareness of India's contributions to mathematics, astronomy and science.
3. To familiarize students with Indian systems of medicine, wellness and yoga.
4. To expose students to Indian art, architecture and literature as expressions of indigenous knowledge.
5. To develop an appreciation of Indian approaches to sustainability, ethics and governance for application in contemporary contexts.

Unit - I	Introduction to Indian Knowledge System	9 Hrs

Nature and Scope of Indian Knowledge System (IKS), Sources of Indian Knowledge: Vedas, Upanishads, Puranas and Agamas, Concept of Knowledge (Jnana) in Indian Tradition, Classification of Knowledge Systems, Schools of Indian Philosophy: Astika and Nastika Darshanas (Overview), Relevance of IKS in Contemporary Education and Research.

Unit - II	Indian Mathematics and Astronomy	9 Hrs

Contributions of Ancient and Medieval Indian Mathematicians: Aryabhata, Brahmagupta, Bhaskaracharya, Madhava and the Kerala School; Concept of Zero and the Decimal System, Vedic Mathematics: Sutras and Applications, Indian Astronomy: Surya Siddhanta, Panchanga (Indian Calendar System), Instruments used in Indian Astronomy (Jantar Mantar).

Unit - III	Indian Systems of Medicine and Wellbeing	9 Hrs

Ayurveda: Principles, Tridosha Theory, Panchamahabhuta Concept, Foundations of Yoga: Patanjali's Ashtanga Yoga, Yoga and Health, Introduction to Siddha and Unani Systems, Concept of Wellbeing in Indian Tradition, Relevance to Modern Healthcare and Preventive Medicine.

Unit - IV	Indian Art, Architecture and Literature	9 Hrs

Overview of Indian Architecture: Temple Architecture, Vastu Shastra Principles, Indian Art Forms: Classical Dance, Music and Sculpture, Indian Literature: Vedic and Classical Sanskrit Literature, Sangam Literature, Contribution of Indian Languages to Knowledge Preservation, Indigenous Knowledge in Agriculture and Water Management.

Unit - V	Indian Approaches to Sustainability, Ethics and Governance	9 Hrs

Concept of Sustainability in Indian Tradition: Prakriti and Purusha, Indian Ecological Practices and Conservation Traditions, Indian Ethics: Concepts of Dharma, Karma and Purushartha, Indian Systems of Governance: Arthashastra and Polity, Indigenous Knowledge Systems and their Relevance to Modern Engineering, Technology and Sustainable Development.

Total Hours	45 Hrs

Course Outcomes:	POs	PSOs	Peak BTL

1. Understand the nature, scope and sources of the Indian Knowledge System and its relevance to contemporary education.	PO1, PO12	**2**	**2**
2. Explain the contributions of Indian mathematicians and astronomers, and apply basic Vedic mathematics techniques.	PO1, PO2, PO12	**1,2**	**3**
3. Describe the foundational principles of Ayurveda, Yoga and other Indian systems of medicine, and relate them to modern health and wellness practices.	PO1, PO6, PO12	**2**	**3**
4. Analyze the significance of Indian art, architecture and literature as expressions of indigenous knowledge.	PO1, PO6, PO12	**2**	**4**
5. Evaluate Indian approaches to sustainability, ethics and governance, and assess their relevance to modern engineering and sustainable development.	PO1, PO6, PO7, PO8, PO12	**2,3**	**5**

Text Books:

1. B. Mahadevan, Vinayak Rajat Bhat and Nagendra Pavana R.N., Introduction to Indian Knowledge System: Concepts and Applications, PHI Learning Private Ltd., 2022.
2. Amit Jha, Traditional Knowledge System in India, Atlantic Publishers and Distributors (P) Ltd., 2009.
3. Kapil Kapoor and Avadhesh Kumar Singh, Knowledge Traditions and Practices of India, Vol. 1, D.K. Printworld (P) Ltd., 2005.

Reference Books:

1. Kapil Kapoor and Avadhesh Kumar Singh, Knowledge Traditions and Practices of India, Vol. 2, D.K. Printworld (P) Ltd., 2005.
2. Subhash Kak, The Wishing Tree: Presence and Promise of India, iUniverse, 2008.
3. David Frawley, Vedic Ecology: Practical Wisdom for Environmental Crisis, Motilal Banarsidass, 2015.

Web Links (Online Source):

1. https://nptel.ac.in/courses/121106003
2. https://nptel.ac.in/courses/109107003

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**											**2**		**1**	
CO2	**3**	**1**										**1**	**1**	**1**	
CO3	**2**					**1**						**2**		**2**	
CO4	**2**					**2**						**1**		**2**	
CO5	**2**					**3**	**3**	**2**				**2**		**3**	**1**
CO*	**2.4**	**1.0**				**2.0**	**3.0**	**2.0**				**1.6**	**1.0**	**1.8**	**1.0**

Level: 3 – High, 2 – Moderate, 1 - Low

26SOTL2302	DATABASE MANAGEMENT SYSTEMS LAB (Common to CSE, CSE(AI&DS, AI&ML, CS, CC, AI&HT)	L	T	P	C
		0	0	2	1

Prerequisite: Basic knowledge of Database concepts (theory course).

Course Description:

This Laboratory course introduces the query language for design and development of a database using software's such as SQL and ORACLE. It provides practice on built-in SQL functions using DDL, DCL, DML and TCL commands to create and manage database systems and perform Set operations, Sub-Queries and Joins; and PL/SQL programs to implement Exceptions, Cursors, Stored Functions, Views, Sequences, Locks and Triggers.

Course Objectives:

1. Demonstrate practical knowledge on creation and alteration of tables, insertion and querying of data, and analyse and evaluate databases using SQL DML/DDL commands.
2. Write SQL queries to implement a database schema for the given database.
3. Design a simple database using a tool and implement it using SQL.
4. Implement DDL and DML commands in SQL and PL/SQL, ORACLE to manage data in databases.
5. Program in PL/SQL including procedures, functions, cursors and triggers.

List of Experiments:

Exp. No	Title of the Experiment	COs
1	**A)** Practice of DDL and DML Commands. **B)** Exercise on DDL and DML Commands.	CO2
2	Practice of SQL Operators — Arithmetic, Logical, Relational, Between, Is Null and Like operators.	CO2
3	Exercise on SQL Operators.	CO2
4	Practice of different Integrity Constraints — Not Null, Check, Primary Key, Unique Key and Referential Integrity (Foreign Key) Constraints.	CO3
5	Exercise on Integrity Constraints.	CO3
6	Exercise on Relational Algebra operations — Set operations, and different types of Joins such as Natural Join, Equi Join, Theta Join and Outer Join.	CO2
7	Practice of SQL Functions — Number, Character, Date, Conversion and Aggregate functions.	CO2
8	Write PL/SQL programs for the following: i) Swap two numbers. ii) Find the largest of three numbers. iii) Find the total and average of 6 subjects and display the grade. iv) Find the sum of digits in a given number. v) Display a given number in reverse order. vi) Check whether a given number is a perfect number or not. vii) Find the factorial of a given number. viii) Calculate the area of a circle for radius varying from 3 to 7, and store the radius and calculated area in a table named areas.	CO5
9	Exercise on Triggers and Cursors.	CO5

10	Case Study: Design and implement a database for a real-world application by analysing the data requirements, normalizing the attributes, and creating the logical data model (E-R diagram). Students may choose one domain such as Hospital Management or Student Progress Monitoring. The solution should include requirement analysis, normalization, E-R diagram, schema creation and SQL implementation.	**CO1, CO4**
Total Hours		**45 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Design and develop a normalized relational database schema for a real-world application, including identification of entities, attributes and relationships.	PO1, PO2, PO3	1,2,3	**3**
2. Formulate and execute SQL queries using DDL, DML, DCL and TCL commands to create, retrieve, update and manage data stored in a database.	PO1, PO2, PO3	1,2,3	**3**
3. Decide and apply appropriate integrity constraints such as Primary Key, Foreign Key, Unique, Not Null and Check constraints to ensure data accuracy and referential integrity.	PO1, PO2, PO3	1,2,3	**3**
4. Investigate data inconsistency and redundancy issues in a database and resolve them by applying normalization techniques and relational algebra operations.	PO1, PO2, PO3, PO4	1,2,3	**4**
5. Implement PL/SQL programs involving procedures, functions, cursors and triggers to automate and manage database operations.	PO1, PO2, PO3, PO4	1,2,3	**5**

Reference Books:

1. Ivan Bayross, *"SQL, PL/SQL Programming"*, 2nd Edition, BPB Publications, New Delhi, 2011.
2. Satish Ansari, *"Oracle Database 11g: Hands-on SQL and PL/SQL"*, PHI Learning, 2010.
3. James R. Groff and Paul N. Weinberg, "SQL: The Complete Reference", 3rd Edition, Tata McGraw Hill, 2010.
4. Steven Feuerstein and Bill Pribyl, "Oracle PL/SQL Programming", 6th Edition, O'Reilly Media, 2014.

CO-POs/PSOs Mapping

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**	**3**	**3**									1	3	2	1
CO2	**2**	**3**	**3**										3	1	1
CO3	**3**	**2**	**2**										2	2	1
CO4	**2**	**3**	**3**	2									2	3	1
CO5	**2**	**3**	**3**	**2**								1	3	2	2
CO*	**2.4**	**2.8**	**2.8**	**2.0**								1.0	2.6	2.0	1.2

Level: 3 – High, 2 – Moderate, 1 – Low

26BTAL2501	FONDATIONS OF DATA SCIENCE LAB	L	T	P	C
		0	0	2	1

Prerequisite: Nil

Course Description:

The **Foundations of Data Science Laboratory** complements the theory course by providing hands-on experience in the complete data science workflow. Students will learn to acquire, clean, preprocess, analyze, visualize, and interpret data using Python and industry-standard data science libraries. The laboratory focuses on practical implementation of statistical concepts, exploratory data analysis, feature engineering, and introductory predictive analytics using real-world datasets. Students will also gain experience in creating interactive dashboards, communicating analytical insights, and developing mini-projects that prepare them for advanced courses in Machine Learning, Artificial Intelligence, Big Data Analytics, and Data Engineering.

Course Objectives:

Upon successful completion of this laboratory course, students will be able to:

1. Develop proficiency in using Python-based data science tools and environments.
2. Acquire, preprocess, clean, and transform structured datasets for analysis.
3. Perform exploratory data analysis and statistical computations using Python libraries.
4. Create meaningful visualizations and interactive dashboards for decision-making.
5. Develop complete data analysis projects by integrating preprocessing, visualization, statistical analysis, and predictive analytics

Recommended Software

- Python 3.x
- Anaconda Distribution
- Jupyter Notebook
- Google Colab

Python Libraries

- NumPy
- Pandas
- Matplotlib
- Seaborn
- Plotly
- Scikit-learn
- Streamlit
- OpenPyXL

Recommended Datasets

- UCI Machine Learning Repository datasets
- Kaggle datasets
- World Bank Open Data
- Government Open Data Portals
- WHO COVID-19 datasets
- Iris Dataset
- Titanic Dataset
- California Housing Dataset
- Wine Quality Dataset

• Breast Cancer Wisconsin Dataset		
List of Experiments:		
Exp. No	**Title of the Experiment**	**COs**
1	**Python Environment and Data Science Setup** • Installation of Anaconda, Jupyter Notebook, Google Colab, Python Packages, Importing Libraries, Reading CSV and Excel Files	1
2	**Data Acquisition and Importing Datasets.** • Perform data import from CSV, Excel, JSON, SQL Database, REST APIs using Pandas.	1
3	**Data Cleaning and Preprocessing** • Perform Missing value treatment, Duplicate removal, Outlier detection, Data type conversion, Data transformation using Pandas.	2
4	**Data Wrangling and Feature Engineering** • Implement Data merging, Grouping, Aggregation, Encoding categorical variables, Feature creation and Feature selection	2
5	**Exploratory Data Analysis (EDA)** • Perform Summary statistics, Correlation analysis, Covariance, Percentiles, Quartiles Data profiling using Pandas.	3
6	**Data Visualization using Matplotlib** • Generate Line charts, Bar charts, Histograms, Scatter plots, Pie charts and Multiple plots	3
7	**Advanced Data Visualization using Seaborn and Plotly** • Generate Heatmaps, Pairplots, Boxplots, Violin plots and Interactive charts	4
8	**Statistical Analysis using Python** • Implement Probability calculations, Sampling, Confidence Intervals, Hypothesis Testing and Correlation Analysis	4
9	**Feature Scaling and Data Preparation** • Perform Standardization, Normalization, Train-Test Split, Label Encoding, One-Hot Encoding using Scikit-learn.	5
10	**Introduction to Predictive Analytics** • Develop simple Linear Regression, Logistic Regression and Decision Tree models using Scikit-learn. • Evaluate models using Accuracy, Precision, Recall, F1-score and Confusion Matrix	5
11	**Interactive Dashboard Development** • Create dashboards using Plotly, Streamlit for visualizing Sales Dataset, Healthcare Dataset and Student Dataset	1-5
12	**Mini Project** • Develop an end-to-end Data Science application involving Data Collection, Data Cleaning, Data Visualization, Statistical Analysis, Predictive Analytics and Dashboard Development using real-world datasets.	1-5

	Suggested Mini Project Titles 1. Student Performance Analytics 2. Healthcare Disease Trend Analysis 3. Customer Churn Prediction 4. Retail Sales Dashboard 5. Crop Yield Analytics 6. Loan Approval Analytics 7. Air Quality Analysis 8. Employee Attrition Analytics 9. Financial Market Dashboard 10. Weather Analytics System	
Total Hours		**45 Hrs**

Course Outcomes:	**POs**	**PSOs**	**Peak BTL**
1. Import, preprocess, clean, and manage datasets using Python and data science libraries.	PO1, PO2, PO3, PO4, PO5, PO8, PO10	**1,2**	**3**
2. Perform exploratory data analysis and statistical computations to discover meaningful patterns.	PO1, PO2, PO3, PO4, PO5	**1,2,3**	**3**
3. Create effective visualizations and interactive dashboards for communicating analytical insights.	PO1, PO2, PO3, PO4, PO5	**1,2**	**4**
4. Develop introductory predictive analytics solutions using Scikit-learn and evaluate their performance.	PO1, PO2, PO3, PO4, PO5, PO8, PO10, PO11	**1,2**	**5**
5. Design and implement complete data science applications integrating data preprocessing, analysis, visualization, and reporting.	PO1, PO2, PO3, PO4, PO5, PO8, PO10, PO11	**1,2,3**	**6**

Reference Books:

1. Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani, *An Introduction to Statistical Learning*, Springer, 2023.
2. Foster Provost and Tom Fawcett, *Data Science for Business*, O'Reilly Media.
3. Han, Kamber and Pei, *Data Mining: Concepts and Techniques*, Morgan Kaufmann.
4. Kevin P. Murphy, *Probabilistic Machine Learning: An Introduction*, MIT Press, 2022.

5. Cathy O'Neil and Rachel Schutt, *Doing Data Science*, O'Reilly Media.
6. Nina Zumel and John Mount, *Practical Data Science with R and Python*, Manning Publications.

Web References

1. UC Berkeley – Data 8: Foundations of Data Science
   https://data8.org/
2. Computational and Inferential Thinking: The Foundations of Data Science (Free Online Textbook)
   https://inferentialthinking.com/
3. Cambridge University Press – Foundations of Data Science (Blum, Hopcroft & Kannan)
   https://www.cambridge.org/core/books/foundations-of-data-science/6A43CE830DE83BED6CC5171E62B0AA9E
4. Google Books – Foundations of Data Science
   https://books.google.com/books/about/Foundations_of_Data_Science.html?id=koHCDwAAQBAJUniversity of Cambridge – Course: Foundations of Data Science https://www.cl.cam.ac.uk/teaching/1920/DataSci/

CO-POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	–	–	–	–	–	–	2	**3**	**2**	**2**
CO2	3	3	2	3	3	–	–	–	–	–	–	2	**3**	**3**	**2**
CO3	3	3	3	3	3	–	–	1	–	2	–	2	**3**	**3**	**3**
CO4	3	3	3	3	3	–	–	1	–	2	1	3	**3**	**3**	**2**
CO5	3	3	3	3	3	1	1	2	2	2	1	3	**3**	**3**	**3**
CO*	3	2.8	2.8	2.8	3	1	1	1.3	2	2	1	2.6	**3**	**3**	**2.6**

Level: 3 - High, 2 - Moderate, 1 - Low