B. Tech. Computer Science and Engineering

Under Regulations- (R-2022)

(w.e.f. 2022-23 admitted batch)

Course Structure and Syllabi

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 specialisation 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: Recognise 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 make Graduates have a strong foundation in fundamentals of mathematics, basic sciences, computer science, and engineering sciences with abilities to analyze problems and design and development of optimal solutions to address societal problems.

PEO 2: To develop knowledge of diverse and emerging areas of computer science with modern tools to solve complex problems; also be sensitive towards health, safety, legal, environmental, and sustainable issues to be professionally competent and globally employable.

PEO 3: To develop an ability to work effectively as an individual/team member or a leader or pursue entrepreneurial skills with good communications and ethical ideologies, practice project and finance management skills.

PROGRAM SPECIFIC OUTCOMES (PSO):

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

PSO 1: Apply the knowledge of computer architecture, software development life cycle, networking, database, and web designing with an emphasis on data structures and algorithms using programming languages and appropriate software tools to solve the specified needs of engineering problems.

PSO 2: Acquaintance of knowledge on the thrust areas for solving societal and local problems with varying complexities.

PSO 3: Design and develop innovative prototypes or projects individually or in a team to solve real-world problems in industry and research establishments.

THE APOLLO UNIVERSITY

ACADEMIC REGULATIONS

SCOPE:

This Academic regulation provide a framework for the regulatory guidelines of all programs 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 program of study.

1. ADMISSION INTO THE PROGRAM

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 program.
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 programs in the media. The provisional admission will be given to the eligible students during the counseling scheduled by The Apollo University. The selected candidates will be provisionally admitted into the program of his/her choice if the candidate meets the program 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 program 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 program 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 quo

3. PROGRAMS

The Apollo University offers variety of programs which includes certificate, undergraduate, postgraduate, and Research. The list of programs on offer for the academic year 2022-23 are annexed in Annexure 2 and those of 2023-24 are annexed in Annexure 3.

Minimum duration of the program

The minimum duration of each program depends on the type of program, viz., undergraduate, postgraduate, integrated programs, etc., and the faculty which offers the program. The maximum duration of the program is N+2 years, where N stands for the minimum duration of the program as mentioned in Annexure 2 and 3. 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 program 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 programs of study are designed to meet the specified number of credit requirements. The courses taken by the student in each semester as part of program 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 program is achieved, the degree can be awarded, subject to fulfilment of all other relevant conditions.

5. STRUCTURE OF THE PROGRAM

The Program structure Consists of

i) University Courses
   - A. University Core
   - B. University Electives

ii) Faculty Courses
   - A. Faculty Core
   - B. Faculty Electives

iii) Program Courses
   - A. Program Core
   - B. Program 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 program
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 program prior to commencement of the first semester. During this program 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 program. 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
		60	Semester-end Examination	iv) Sixty (60) marks for Semester-end examinations
	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 in Table2.

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 program.

Table3: CGPA required for award of Class

Class	**CGPA Required**
First Class with Distinction	$\geq$8.0*
First Class	$\geq$6.5
Second Class	$\geq$5.5
Pass Class	$\geq$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.

1.3 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-totaling 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-totaling and Revaluation of valued answer scripts

- UG candidates may apply for re-totaling / 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 program 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/ 3-years(Lateral Entry) 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 program, 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 program 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 PROGRAMS

Program Type	**Program Name**	**Eligibility**
Bachelor's	**B.Tech. CSE**	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. CSE** **(**Lateral Entry to Second year)	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

PROGRAMS OFFERED BY SCHOOL OF TECHNOLOGY

FROM ACADEMIC YEAR 2022-23

Sl. No.	Program	Expanded	Level	Minimum Duration in Years (N)
1	B. Tech. CSE	Computer Science and Engineering	Bachelor’s	4*
2.	B. Tech. CSE (AI& DS)	Computer Science and Engineering (Artificial Intelligence and Data Structures)	Bachelor’s	4*

* Engineering programs (UG) under Lateral Entry will be with the Minimum duration of 3 years

ANNEXURE 3

PROGRAMS OFFERED BY SCHOOL OF TECHNOLOGY

FROM ACADEMIC YEAR 2023-24

Sl. No.	Program	Expanded	Level	Minimum Duration in Years (N)
1	B. Tech. CSE	Computer Science and Engineering	Bachelor's	4
2.	B. Tech. CSE (AI& DS)	Computer Science and Engineering (Artificial Intelligence and Data Structures)	Bachelor's	4
3	B. Tech. CSE (AI& ML)	Computer Science and Engineering (Artificial Intelligence and Machine Learning)	Bachelor's	4
4	B. Tech CSE (Cybersecurity)	Computer Science and Engineering (Cybersecurity)	Bachelor's	4
5	B. Tech CE (Software Engineering)	Computer Engineering (Software Engineering) with Kalvium	Bachelor's	4
6	M. Tech (VLSI design & ES)	Master of Technology in Very Large Scale Integration Design and Embedded Systems	Masters	2

* Engineering programs (UG) under Lateral Entry will be with the Minimum duration of 3 years

I - Semester

3 Week Induction Programme

Course Code	Course Name	Periods per week			Credits	Hours per week
		L	T	P		
BTCT1701	Engineering Physics	3	1	0	4	4
BTCT1702	Engineering Mathematics	3	1	0	4	4
BTCT1801	Problem Solving and Programming with C	3	1	0	4	4
TAUT1101	University Core – I (Communicative English)	3	0	0	3	3
--	University Elective I	3	0	0	3	3
BTCL1701	Engineering Physics Lab	0	0	3	1.5	3
BTCL1801	Problem Solving and Programming with C Lab	0	0	3	1.5	3
--	IT Work shop	0	0	0	0	1
--	Design Thinking	0	0	0	0	1
--	Soft Skills	0	0	0	0	1
--	Mentoring	0	0	0	0	1
--	Technical Seminar	0	0	0	0	1
--	Library	0	0	0	0	1
--	Physical Activity	0	0	0	0	2
--	Extra-curricular activities	0	0	0	0	2
--	Co-curricular activity	0	0	0	0	1
--	Self-Learning	0	0	0	0	1
TOTAL		**15**	**3**	**6**	**21**	**36**

University Elective – I
Semester – I

S. No	Name of the Course	Host Department
1	Basics of Physiotherapy	School of Health Sciences – Physiotherapy
2	Biostatistics	School of Health Sciences – BMS & GMB
3	Constitution of India	School of Social Sciences
4	Ethical Hacking	School of Technology - CSE
5	Fundamentals of Computers	School of Technology - CSE
6	Gender and Development	School of Social Sciences
7	Leadership Development	School of Management
8	Mathematical Thinking	School of Technology
9	Nursing	Apollo Institute of Nursing
10	One Health	School of Health Sciences – PH
11	Basic Emergency Care and Life Support Skills	School of Health Sciences – AHS
12	Basics of Health Management	School of Health Sciences – AHS
13	Entrepreneurship	School of Management
14	Managerial Economics	School of Management
15	Organic Farming	School of Health Sciences – BMS & GMB
16	Personality Development	School of Health Sciences – Psychology
17	Social Entrepreneurship	School of Management

Note: The list of newly added Elective courses is Enclosed under Appendix I

II - Semester

Course Code	Course Name	Periods per week			Credits	Hours per week
		L	T	P		
BTCT1703	Probability & Statistics	3	1	0	4	4
BTCT1802	Basic Electrical and Electronics Engineering	3	1	0	4	4
BTCT1301	Data Structures	3	1	0	4	4
BTCT1302	Python Programming	3	1	0	4	4
TAUT1102	University Core – II (Environmental Studies)	3	0	0	0	3
--	University Elective II	3	0	0	3	3
BTCL1802	Basic Electrical and Electronics Engineering Lab	0	0	2	1	2
BTCL1301	Data Structures Lab	0	0	2	1	2
BTCL1302	Python Programming Lab	0	0	2	1	2
--	Mentoring	0	0	0	0	1
--	Co-curricular activity	0	0	0	0	1
--	Self-Learning	0	0	0	0	1
--	Physical Activity	0	0	0	0	2
--	Extra-curricular activities	0	0	0	0	2
--	Library	0	0	0	0	1
TOTAL		**18**	**4**	**6**	**22**	**36**

University Elective – II
Semester – II

S. No	Name of the Course
Indian Languages	
1	Hindi
2	Professional English
Foreign Languages	
3	French
4	German

Note: The list of newly added Elective courses is Enclosed under Appendix I

III - Semester

Course Code	Course Name	Periods per week			Credits	Hours per week
		L	T	P		
BTCT2701	Discrete Mathematics and Graph Theory	3	1	0	4	4
BTCT2301	Design and Analysis of Algorithms	3	1	0	4	4
BTCT2302	Object Oriented Programming through Java	3	0	0	3	3
BTCT2801	Digital Logic design	3	0	0	3	3
TAUT2101	University Core – III (Health and Wellness)	3	0	0	3	3
--	University Elective -III	3	0	0	3	3
BTCT2303	Constitution of India	3	0	0	0	3
BTCL2301	Java Programming Lab	0	0	2	1	2
BTCL2801	Digital Logic Design Lab	0	0	2	1	2
--	Mentoring	0	0	0	0	1
--	Co-curricular activity	0	0	0	0	1
--	Self-Learning	0	0	0	0	1
--	Physical Activity	0	0	0	0	2
--	Extra-curricular activities	0	0	0	0	2
--	Soft Skills Training	0	0	0	0	1
--	Certification course	0	0	0	0	1
TOTAL		**21**	**2**	**4**	**22**	**36**

University Elective – III

Semester – III

S. No	Name of the Course	Host Department
1	Community Engagement	School of Social Sciences
2	Clinical Nutrition	School of Health Sciences – BMS & GMB
3	Emotional Intelligence & Mental Health	School of Health Sciences – Psychology
4	Human Rights	School of Social Sciences
5	Industry 4.0	School of Technology – CSE
6	Medical Terminology	School of Health Sciences – BMS & GMB
7	Social Network Analysis	School of Health Sciences – PH
8	Antibiotic Resistance & Biomedical Waste Management	School of Health Sciences – AHS
9	Behavior Change Communication	School of Health Sciences – PH
10	Disability Management	School of Health Sciences – Psychology
11	Disaster Management	School of Social Sciences
12	Human Values & Professional Ethics	School of Social Sciences
13	Infection Prevention & Control	School of Health Sciences – AHS
14	NSS & Youth Development	School of Social Sciences

Note: The list of newly added Elective courses is Enclosed under Appendix I

IV - Semester

Course Code	Course Name	Periods per week			Credits	Hours per week
		L	T	P		
BTCT2702	Deterministic Stochastic and Statistical Methods	3	1	0	4	4
BTCT2901	Management for Engineers	3	0	0	3	3
BTCT2501	Software Engineering	3	0	0	3	3
BTCT2304	Database Management Systems	3	1	0	4	4
BTCT2305	Operating Systems	3	1	0	4	4
BTCT2306	Universal Human Values	3	0	0	0	3
BTCT2307	Computer Organisation and Architecture	3	1	0	4	4
BTCL2302	Database Management Systems Lab	0	0	2	1	2
BTCL2501	Exploratory Data Analytics with R lab	0	0	2	1	2
--	Mentoring	0	0	0	0	1
--	Aptitude and Logical Reasoning	0	0	0	0	1
--	Library	0	0	0	0	1
--	Physical Activity	0	0	0	0	2
--	Extra-curricular activities	0	0	0	0	2
--	**Internship – I* will be Evaluated in VIII Sem**	-	-	-	-	-
TOTAL		**21**	**4**	**4**	**24**	**36**

*** Internship I Slot is scheduled during Summer break**

Value Added Courses	
Course Code	**Course Name**
BTCA0001	Getting Started with Google Cloud Learning Path
BTCA0002	Fundamentals of Data Analytics
BTCA0003	Introduction to Blockchain Technology
BTCA0004	Oracle Cloud Infrastructure Architect

V - Semester

Course Code	Course Name	Periods per week			Credits	Hours per week
		L	T	P		
BTCT3501	Full Stack Web Development	3	0	0	3	3
BTCT3301	Computer Networks	3	0	0	3	3
BTCT3502	Data Warehousing and Mining	3	0	0	3	3
SOTT3401	Faculty Elective-I	3	0	0	3	3
BTCT3601	Program Elective-I	3	0	0	3	3
BTCM3501	MOOC - I	0	0	0	3	3
BTCT3302	Entrepreneurship and Start up Management	3	0	0	0	3
BTCL3501	Full Stack Web Development Lab	0	0	2	1	2
BTCL3502	Data Warehousing and Mining Lab	0	0	2	1	2
--	Mentoring	0	0	0	0	1
--	Library	0	0	0	0	1
--	Physical Activity	0	0	0	0	2
--	Extra-curricular activities	0	0	0	0	2
--	Technical Seminar	0	0	0	0	1
--	CRT	0	0	0	0	4
TOTAL		**18**	**0**	**8**	**22**	**36**

Faculty Elective - I			
Course Code	**Course Name**	**Course Code**	**Course Name**
SOTT3401a	Object Oriented Analysis and Design	SOTT3401j	Numerical Methods for Engineers
SOTT3401b	Software Engineering	SOTT3401k	Mathematical Foundations of Cyber Security
SOTT3401c	Artificial Intelligence	SOTT3401l	Information Retrieval Systems
SOTT3401d	Computer Organisation and Architecture	SOTT3401m	Cryptography and Network security
SOTT3401e	Linux Programming	SOTT3401n	Principles of Programming Languages
SOTT3401f	Advanced Data Structures	SOTT3401o	Unix and Shell Programming
SOTT3401g	Data Warehousing and Mining	SOTT3401p	Introduction to Psychology
SOTT3401h	Machine Learning	SOTT3401q	Industry 4.0
SOTT3401i	Differential Equations and Vector Calculus	SOTT3401r	Computer Vision

Program Elective -I	
Course Code	**Course Name**
BTCT3601a	Software Testing Methodologies
BTCT3601b	Distributed Computing
BTCT3601c	Advanced Java Programming
BTCT3601d	Network Security
BTCT3601e	Database Security

Value Added Courses	
Course Code	**Course Name**
BTCA0005	Database Engineer Learning Path
BTCA0006	Big Data Foundation Course
BTCA0007	Programming Basics for Blockchain Engineers
BTCA0008	Oracle Cloud Security Administrator

VI - Semester

Course Code	Course Name	Periods per week			Credits	Hours per week
		L	T	P		
BTCT3303	Automata and Compiler Design	3	1	0	4	4
BTCT3503	Cloud Computing	3	0	0	3	3
SOTT3402	Faculty Elective -II	3	0	0	3	3
BTCT3602	Program Elective – II	3	0	0	3	3
BTCT3603	Program Elective – III	3	0	0	3	3
BTCM3502	MOOC-II	0	0	0	3	3
BTCL3503	Cloud Computing Lab	0	0	2	1	2
BTCL3504	Android Application Development Lab	0	0	2	1	2
--	Mentoring	0	0	0	0	1
--	Library	0	0	0	0	1
--	Physical Activity	0	0	0	0	2
--	Extra-curricular activities	0	0	0	0	2
--	Valued added courses	0	0	0	0	2
--	Technical Training	0	0	0	0	3
--	Self-Learning	0	0	0	0	2
--	**Internship – II* will be Evaluated in VIII Sem**	-	-	-	-	-
TOTAL		**15**	**1**	**4**	**21**	**36**

*** Internship II Slot is scheduled during Summer break**

Faculty Elective -II			
Course Code	**Course Name**	**Course Code**	**Course Name**
SOTT3402a	Design Patterns	SOTT3402q	Embedded Systems
SOTT3402b	Cyber Security	SOTT3402r	Green Computing
SOTT3402c	Software Project Management	SOTT3402s	Cloud Security
SOTT3402d	Agile Software Development	SOTT3402t	DevNet
SOTT3402e	Cloud Computing	SOTT3402u	Advanced Computer Networks
SOTT3402f	Mobile Computing	SOTT3402v	Network Security
SOTT3402g	Image Processing	SOTT3402w	Fault Tolerant Systems
SOTT3402h	Deep Learning	SOTT3402x	Computational Intelligence
SOTT3402i	E-Commerce	SOTT3402y	Data Analytics with Tableau
SOTT3402j	Blockchain Technology	SOTT3402z	Human Computer Interaction
SOTT3402k	Mathematical Foundations of Data Science		
SOTT3402l	Transforms and Boundary Value Problems		
SOTT3402m	Optimization Techniques		
SOTT3402n	Information Security		
SOTT3402o	Ethical Hacking		
SOTT3402p	Internet of Things		

Program Elective -II	
Course Code	**Course Name**
BTCT3602a	Deep Learning
BTCT3602b	Intrusion Detection System
BTCT3602c	Internetworking with TCP/IP
BTCT3602d	Digital Signal Processing
BTCT3602e	Database Administration

Program Elective -III	
BTCT3603a	Software Project Management
BTCT3603b	High Performance Computing
BTCT3603c	MERN Technologies
BTCT3603d	Cyber Security
BTCT3603e	Software Requirements Management

Value Added Courses	
Course Code	**Course Name**
BTCA0009	Data Analyst Learning Path
BTCA0010	BDA Foundation
BTCA0011	Blockchain Essentials
BTCA0012	Oracle Cloud Operations Engineer

VII - Semester

Course Code	Course Name	Periods per week			Credits	Hours per week
		L	T	P		
BTCT4501	Big Data Analytics	3	0	0	3	3
BTCT4502	Internet of Things	3	0	0	3	3
BTCT4601	Program Elective – IV	3	0	0	3	3
BTCT4602	Program Elective – V	3	0	0	3	3
BTCM4501	MOOC-III	0	0	0	3	3
BTCP4501	Mini Project	0	0	2	1	2
BTCL4501	Big data Analytics Lab	0	0	2	1	2
BTCL4502	Internet of Things Lab	0	0	2	1	2
--	Mentoring	0	0	0	0	1
--	Library	0	0	0	0	1
--	Physical Activity	0	0	0	0	2
--	Extra-curricular activities	0	0	0	0	2
--	Valued added courses	0	0	0	0	1
--	Seminar	0	0	0	0	1
--	Technical Training	0	0	0	0	6
--	Technical Paper Writing	0	0	0	0	1
TOTAL		**12**	**0**	**10**	**20**	**36**

Program Elective -IV		Program Elective -V	
Course Code	**Course Name**	**Course Code**	**Course Name**
BTCT4601a	Augmented & Virtual Reality	BTCT4602a	Mobile Computing
BTCT4601b	Blockchain Technology	BTCT4602b	Secured Software Engineering
BTCT4601c	Natural language Processing	BTCT4602c	Hands on DevOps
BTCT4601d	No SQL DataBases	BTCT4602d	Game Programming
BTCT4601e	Soft Computing	BTCT4602e	Operating System Security

Value Added Courses	
Course Code	**Course Name**
BTCA0013	BI and Analytics with Looker
BTCA0014	Big Data Technology
BTCA0015	Certified Blockchain Developer

VIII - Semester

Course Code	Course Name	Periods per week			Credits	Hours per week
		L	T	P		
BTCP4502	Project Work	0	0	24	12	24
BTCI3501	Internship – I Evaluation#	0	0	0	2	0
BTCI4501	Internship-II Evaluation#	0	0	0	2	0
TOTAL		**0**	**0**	**24**	**16**	**24**

 # Internship – I during the IV semester and Internship – II during the VI semester are posted in the VIII Semester

I SEMESTER

BTCT1701	ENGINEERING PHYSICS	L T P C
		3 1 0 4

Course Description:

Engineering Physics is a course made for those keen on research as well as engineering at the same time. It clubs together with the fields of Engineering as well as applied sciences and creates a course that helps one gain collective knowledge of the new concepts in the field of physics while also studying and researching their applications at the same time. Engineering Physics course allows you to pursue a wide range of topics at the same time, thus giving you several different options for a career. Being extremely vast and technical, the Engineering Physics course is a much-respected degree that stands apart from other engineering degrees and can be extremely rewarding at the same time.

Course Objectives:

1. Introducing fundamental concepts of physics that helps student understand intricacies of physical world around us.
2. Introducing Quantum aspects of nature starting from the Newtonian Mechanics and wave concepts of nature, with the help of explanations from ground breaking experiments of 20th Century.
3. Introducing general Optical phenomena basing on wave nature of electromagnetic radiation.
4. Introducing various applications of quantum mechanics such as LASERs, Fibre Optics and Semiconductors devices.
5. Introducing the applications of semiconductors in the modern era

UNIT I **20 Hrs**

Mechanics, waves and Oscillations: Newton Laws & Equations of Motion, Momentum, Energy, Angular Momentum, Rigid Body Motion, Periodic Motion & Superposition, Free and Forced Vibrations, Resonance and Coupled Oscillators.

UNIT II **8 Hrs**

Concepts of Quantum Mechanics: Particle properties of waves, Wave properties of particles, Atomic Structure, Schrödinger’s Equation, Particle in a Box, Finite Potential Well, Quantum Harmonic Oscillator.

UNIT III **8 Hrs**

Statistical Mechanics: Statistical Distributions, Maxwell-Boltzmann Statistics, Molecular energies in an Ideal Gas Quantum Statistics, Applications of Statistical mechanics.

UNIT IV **16 Hrs**

Optics: Wave Optics: Electro Magnetic Radiation and Electro Magnetic Spectrum, Super Position of Waves, Refraction, Reflection, Interference, Diffraction and Polarisation.

LASERS: Characteristics of LASER, Spontaneous and Stimulated Emission of Radiation, Einstein’s Coefficients and their significance. Meta-stable State, Pumping, Population Inversion. Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers.

Fiber Optics: Principle and construction of optical fibre, Acceptance Angle and Numerical Aperture, Classification of Optical Fibers, Attenuation in Optical Fibers (scattering, absorption andbending losses) Applications of Optical Fibers.

UNIT V **8 Hrs**

Semiconductors and Semiconductor devices: Semiconductors Fermi Level in Intrinsic and Extrinsic Semiconductors. Carrier concentration of Intrinsic Semiconductor. Carrier concentration of Extrinsic Semiconductor (qualitative).

Semiconductor devices - Formation of a PN Junction and working of a PN Junction diode, Energy band Diagram of open circuited PN Diode, I-V Characteristics of PN Junction diode. Applications:LED, Solar Cell and Photo diode.

Course Outcomes:

1. The problem-solving capabilities.
2. Quantitative aspects of wave and vibrations and its importance in understanding light.
3. Understanding of the statistical distributions and some simple thermodynamic applications
4. Understanding preliminary concepts of Quantum nature and how it gives birth to modern engineering.
5. Analyse the functionalities of the semiconductor devices.

Text Books:

1. B.K. Pandey & S. Chaturvedi Engineering Physics, Cengage Learning.
2. Avadhanulu M N., Kshirsagar P G, A text book of Engineering Physics, S Chand publications Pvt. Ltd, 2014.
3. D.K Bhattacharya and Poonam Tandon, Engineering Physics, Oxford Higher Education Press, 2015.

Reference Books:

1. P K Palanisamy, Engineering Physics, Sitech Publications.
2. Charles Kittel, Introduction to Solid State Physics, John Wiley Publisher.
3. A.S. Vasudeva, Modern Engineering Physics, S Chand.
4. Dekker, Solid State Physics.

BTCT1702	ENGINEERING MATHEMATICS	L T P C
		3 1 0 4

Course Description:

This course is about the basic mathematics that is fundamental and 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 quadratic forms.
3. 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 mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

UNIT I **12 Hrs**

Matrices: Rank of a matrix by echelon form, system of homogeneous and non-homogeneous linear equations. Eigen values, Eigen vectors of Matrices, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem.

UNIT II **12 Hrs**

Quadratic forms: Symmetric matrix, Orthogonal matrices, Diagonalisation of a matrix by orthogonal process. Quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.

UNIT-III **12 Hrs**

Mean value theorems: Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof); Properties and Problems.

UNIT IV **12 Hrs**

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

UNIT V **12 Hrs**

Multiple integrals: 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 co-ordinates.

Course Outcomes:

After completion of the course, students will be able to

1. Analyse the solutions of the system of linear equations and find the Eigen values and Eigen vectors of a matrix, which are used to analyse the long-term behaviour of any system.
2. Reduce the quadratic form to canonical form using orthogonal transformations.
3. Utilize mean value theorems to real life problems.
4. Familiarize with functions of several variables, which is useful in optimization.
5. Evaluate multiple integrals in various coordinate systems.

Text Books:

1. E. Kreyszig, Advanced engineering mathematics", John wiley & Son's 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.

BTCT1801 PROBLEM SOLVING AND PROGRAMMING WITH C L T P C

3 1 0 4

Course Description:

The course is designed to provide complete knowledge of C language, improves logical skills which will help to create programs, applications in C and by learning the basic programming constructs they can easily switch over to any other language in future.

Course Objectives:

The objective of this course is to make students to:

1. Familiarize the environment of structured programming and enabling to build logic with algorithms and flowcharts.
2. Know the concepts of evaluation of expressions, conditional branching and loops.
3. Understand the features, train the student to convert the logic into program using a top-down approach.
4. Apply the concepts like, arrays and pointers in solving the real-world problems.
5. Demonstrate the concepts of structure, union and file handling operations.

UNIT I 10 Hrs

Introduction to Computers and Problem Solving: What is computer, Introduction to components of a computer: Hardware, Software, Programming Language Types, Compiler, Problem Solving Aspect, Top-Down Design.

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart with examples.

From algorithms to programs: source code, variables, data types and memory locations, Syntax and Logical Errors in compilation, object and executable code

UNIT II 13 Hrs

History of C language, Characteristics of C language, C Character Set, C Tokens, Input-Output Statements, Structure of C Program, Arithmetic expressions, Operator Precedence & Associativity, Conditional Branching and Loops, Writing and evaluation of conditionals and consequent branching and Jumping Constructs, Iteration and loops.

UNIT III 12 Hrs

Function: Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference, Storage Classes.

Recursion, Example programs: Finding Factorial, Fibonacci series, Ackermann function.

UNIT IV 13 Hrs

Arrays: Arrays (1-D, 2-D), Character arrays and strings

Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notation of linked list (no implementation), Dynamic Memory allocation Functions.

UNIT V **12 Hrs**

Structures: Defining structures and Array of Structures, Nested Structures, enum, typedef, Union.

File handling: File Handling Functions, File Modes, File Operations.

Course Outcomes:

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

1. Formulate simple algorithms for arithmetic, logical problems and to translate the algorithms to programs (in C language)
2. Test and execute the programs and correct syntax and logical errors, to implement conditional branching, iteration.
3. Decompose a problem into functions and synthesize a complete program using divide and conquer approach.
4. Use arrays, pointers to formulate algorithms and programs for real-world problems.
5. Apply programming to solve the problems of storing different data's and various operations on files.

Text Books:

1. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
2. B.A. Forouzan and R.F. Gilberg, Computer science, a structured programming approach using C, Third edition, Thomson.

Reference Books:

1. R.G. Dromey, ―How to Solve it by Computer‖, Low Price Edition, Pearson Education India, 2008.
2. The C Programming Language, B.W. Kernighan, Dennis M. Ritchie, PHI/Pearson Education.
3. Let us C by Yashwanth P. Kanetkar 8th edition BPB publication.

TAUT1101 **COMMUNICATIVE ENGLISH** **L T P C**
3 0 0 3

Course Description:

The creation of the Course is to facilitate Stakeholders in productively using the Language to functional advantage to form meaningful engagements in a social context and influence their professional dynamic.

Course Objectives:

The objective of this course is to make students to:

1. To expand and enhance vocabulary systematically for clear communication, richer expression, and deeper comprehension across various contexts."
2. To provide the grammatical knowledge and skills necessary to communicate effectively in English, both orally and in writing.
3. To strengthen their ability to write academic papers, essays and summaries using the "Mind Mapping,' dynamic.
4. To enhance communication skills by analyse, evaluate, and express their opinions on various topics, fostering the development of critical thinking abilities
5. To develop proficiency in listening, speaking, reading and writing, enabling individuals to communicate effectively in various real-life situations.

UNIT I **9 Hrs**

Vocabulary and Reading: Special Features of English Vocabulary, Reading With Purpose; Understanding What is Read; Drawing a Conclusion Based on Inferences, Deduction, Reading Between the Lines, Context, Connotation, Higher Order Thinking; How to Explain Specific Information with Clarity; Defining and Giving Reasons; Giving Directions; Professional Vocabulary.

UNIT II **9 Hrs**

Basic Grammar: Subject-Verb Agreement; Verb Tenses; Active-Passive Voice; Direct and Indirect Speech; Question Tags; Degrees of Comparison; Articles; Avoiding Jargon.

UNIT III **9 Hrs**

Writing: Letter Writing; Report Writing; E-Communication, Drafting and Collating Key Information, Taking Notes from Lectures, Reading Materials, Reporting on Minutes of the Meeting, Precis Writing

UNIT IV **9 Hrs**

Basics of Communication: Role of Communication; Purpose of Communication; Barriers to Communication; Verbal and Non-Verbal Communication, Communication at the Workplace; Human Needs and Communication; "Mind Mapping" Communication; E-Communication.

UNIT V **9 Hrs**

Presentations: Self-Introduction; Individual Presentation; Group Discussions; Debates.

Course Outcomes:

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

1. To review grammatical structures of English and the use of these forms in specific communicative contexts, which include: class activities, homework assignments, reading of texts and writing and functional real-world facets.
2. To improve their accuracy and fluency in producing and understanding spoken and written English and endorse this proficiency in both personal and professional realms.
3. To attain and enhance competence in the four modes of literacy: Writing, Speaking, Reading and Listening.
4. To develop their ability as critical thinkers.
5. To empower the individuals to connect, engage, and thrive in diverse personal and professional environments.

Text Books:

1. Meenakshi Raman and Sangeeta Sharma, “Technical Communication: Principles and Practice”, 3rd Edition, Oxford University Press, 2015.
2. M. Ashraf Rizvi, “Effective Technical Communication”, Second Edition, McGraw. Hill Education, 2017.
3. Wilfred Funk and Norman Lewis, “30 Days to a More Powerful Vocabulary”, Latest Edition, Pocket Books, 2021.

Reference Books:

1. Grant Taylor, “English Conversation Practice”, Tata McGraw-Hill Education India, 2016.
2. Gary Blake and Robert W. Bly, “The Elements of Technical Writing”, 2nd Edition, 2000, Longman.
3. Raymond Murphy, “English Grammar in Use”, Fourth Edition, Cambridge University Press, 2019.

BTCL1701 **ENGINEERING PHYSICS LAB** **L T P C**

0 0 3 1.5

Prerequisite: Nil

Course Description:

The aim of this course is to make the 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 the modern technology.

Course Objectives:

1. To teach students, the importance of physics through involvement in experiments.
2. To have knowledge of the world due to constant interplay between observations and hypothesis, experiment and theory in physics.
3. To gain knowledge in various areas of physics so as to have real time applications in all engineering streams.
4. To determine the wavelength of the laser source and numerical aperture of optical fibre
5. To analyse the usage of semiconductor devices and its applications

Concepts of Experimental Physics

1. Error-Analysis and Drawing Graph

Mechanics - waves and Oscillations

2. Compound Pendulum
3. Estimation of the moment of inertia of a Fly wheel.
4. Estimation of the Young's modulus of a steel wire using a torsion pendulum.
5. Melde's Experiment
6. Resonance in LCR Circuits

Optics

7. Determine the thickness of the wire using wedge shape method
8. Determination of the radius of curvature of the lens by Newton's ring method
9. Determination of wavelength by plane diffraction grating method
10. Determination of dispersive power of prism.
11. Determination of wavelength of LASER light using diffraction grating.
12. To determine the numerical aperture and acceptance angle of a given optical fibre

Semiconductor Physics

13. Energy Gap of a semi-conductor.
14. I-V Characteristics (Resistor, Diode, Solar Cell, LDR)

Course Outcomes:

1. After completing this course, the student must demonstrate the knowledge and ability to:
2. Develop analytical/experimental skills and impart prerequisite hands-on experience for engineering laboratories

3. Understand the need for precise measurement practices for data recording.
4. Understand the principle, concept, working and applications of relevant technologies and comparison of results with theoretical calculations
5. Analyse the techniques and skills associated with modern scientific tools such as lasers and fibre optics
6. Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.

BTCL1801 PROBLEM SOLVING AND PROGRAMMING WITH C LAB **L T P C**

0 0 3 1.5

Course Description:

This lab course is designed to improve knowledge, logical skills, enhances the analyzing and problem-solving skills which can be used for developing programs in C.

Course Objectives:

The objective of this course is to make students to:

1. Understand the environment and enable to write algorithm and draw the flowchart.
2. Create the programs using control statements.
3. Analyse and modularise the problem into sub programs.
4. Develop programs using the concepts of arrays and strings.
5. Solve the memory access related problems and can analyse the file handling mechanisms.

1. A) Write an algorithm, draw a flowchart for:
   - i) Finding the area and circumference of a circle of given radius.
   - ii) Finding the volume of a sphere of given radius.
   - iii) Finding the interest on a given principle for a given period of time at a given rate of interest per year.

   B) Familiarization with programming environment and write a C program for:
   - i) Finding the area and circumference of a circle of given radius.
   - ii) Finding the volume of a sphere of given radius.
   - iii) Finding the interest on a given principle for a given period of time at a given rate of interest per year.
2. A) Write a C program to calculate the total and percentage of a student for the given marks.

   B) Write a C program to display all the sizes of datatypes in C.

   C) Write a C program to convert an integer into character.
3. A) Write a C program to find whether a given number is even or odd.

   B) A salesman gets a commission of 5% on the sales if his sales are below Rs.5000/- and a commission of 8% on the sales that exceeds Rs.5000/- together with Rs.250/-. Write an algorithm or a flowchart and develop C program for computing the commission of the salesman, based on his sales.

   C) Write a C program in the menu driven style to perform the operations +, -, *, /, % between two given integers.
4. A) i) Write three C programs to print a multiplication table for a given number using while, do-while, and for loops.

   ii) Write a C program to construct Pascal's triangle.

   B) Write a C program to compute the sum of:
   - i) $1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$, given x and n.
   - ii) $1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10! + \ldots$ to n terms where the n^{th} term becomes less than 0.0001.
5. A) Write C functions for the following:
   - i) A function that takes an integer n as argument and returns 1 if it is a prime number and

0 otherwise.

ii) A function that takes a real number x and a positive integer n as arguments and returns x^n.

iii) A function that takes a positive integer n as an argument and returns the n^{th} Fibonacci number.

6. Using recursion write C functions for the following:
   i) Factorial of a non-negative integer n.
   ii) Greatest Common Divisor of two integers.
7. A) Write a program to store the numbers given by the user in an array, and then to find the mean, deviations of the given values from the mean, and variance.
   B) Write a program to store user given numbers in an array and find the locations of minimum and maximum values in the array and swap them and display the resulting array.
8. A) Write a C program to implement the operations of matrices – addition, subtraction, multiplication
   B) Write a C program that uses functions to perform the insertion of a substring into a given main string from a given position and delete n characters from a given position in a given string.
   C) i) Write a C program to determine whether a given string is palindrome or not.
   ii) Write a C program to count the lines, words and characters in a given text.
9. A) Write a C program to swap two numbers using pointers.
   B) Define a structure and union for student having members roll no., name, class, section, marks. Create an array of 5 students and find the average marks for every student.
10. A) Write a function which copies the contents of one file to another and display the file Contents
    B) Write a C program to reverse the first n characters in a file.
    C) Write a C program to merge two files into a third file.

Course Outcomes:

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

1. Formulate the algorithms and can draw flowcharts for simple problems
2. Write conditional and iterative programs.
3. Develop the programs using sub functions and recursion.
4. Represent data in arrays, strings and can manipulate them.
5. Create files and perform simple operations like reading and writing on files.

Text Books:

1. B.A. Forouzon and R.F. Gilberg, “COMPUTER SCIENCE: A Structured Programming Approach Using C”, Third edition, CENGAGE Learning, 2016.
2. Richard F. Gilberg & Behrouz A. Forouzan, “Data Structures: A Pseudocode Approach with C”, Second Edition, CENGAGE Learning, 2011.

Reference Books:

1. Pradip Dey and Manas Ghosh, Programming in C, Oxford University Press, 2nd Edition 2011.
2. E. Balaguruswamy, “C and Data Structures”, 4th Edition, Tata Mc Graw Hill.
3. A. K. Sharma, Computer Fundamentals and Programming in C, 2nd Edition, University Press.

University Elective – I
(Semester -I)

TAUT1201A **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**

i. What is Physiotherapy?
ii. Types of Physiotherapy
iii. Benefits of Physiotherapy
iv. Why is Physiotherapy done?

UNIT II Women's Health **5 Hrs**

i. Pre natal exercises & Care
ii. Post Natal exercises

UNIT III Acute injuries & management and the uses of Orthotics & Prosthetics **10 Hrs**

i .Mechanism of injury
ii. Acute muscle injuries
-Muscle strain
-Risks of muscle strain
-Muscle imbalance:
-Muscle inflexibility:
iii. Ligament sprain and difference between sprain and strain
iv. Orthotics & Prosthetics

UNIT IV Ergonomics & Health and Aerobics **13 Hrs**

i. work-related musculoskeletal disorders (MSDs).
ii. Risk factors associated with work-related MSDs & Possible Causes
iii. Common ergonomic symptoms
iv. Different types of Ergonomics & principles of ergonomics and v. Ergonomic Control Methods
v. Awkward body postures – hazards
vi. Physical Activity and exercise
vii. Physical Fitness and Maximum Oxygen Consumption
viii. Aerobic Exercise Training and Physiological Response to Aerobic Exercise
ix. Cardiovascular Response to Exercise and Respiratory Response to Exercise
x. Responses Providing Additional Oxygen to Muscle and Exercise Program

xi. Warm-Up Period, Aerobic Exercise Period and Cool-Down Period Application

UNIT V Education & Awareness about common diseases and BLS **12 Hrs**

i. Bell's palsy
ii. Diabetes
iii. Coronary artery heart disease
iv. OA Knee
v. Stroke
vi. LBA
vii. Early identification of congenital anomalies
viii. BLS Theory
ix. BLS Practical's

Course Outcomes:

1. Gain the basic knowledge of Physiotherapy
2. Familiarize the procedures and techniques used in physiotherapy
3. Protect and manage from the sport injuries
4. Gain Knowledge about Ergonomics
5. To maintain physical fitness

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)

TAUT1201B **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.

Course Outcomes:

1. Ability to design experiments, sampling variables, analyze the biological data, interpret andpresent the results in meaningful way.
2. Create tables and graphs for data presentation
3. Describe measures of central tendency and dispersion along with calculating probabilityfeatures of experiments.
4. Discuss the correlation between various types of data along with associated variables.
5. Test hypothesis and carry out related statistical tests

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).

TAUT1201C **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 andhelp 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 federalsystem.
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.

Course Outcomes:

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.
2. Exercise his fundamental rights in proper sense at the same time identifies his responsibilities in national building.
3. Analyze the Indian political system, the powers and functions of the Union, State and Local Governments in detail
4. Understand Electoral Process, Emergency provisions and Amendment procedure.

5. Take part in competitive examinations with confidence.

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

TAUT1201D	ETHICAL HACKING	L T P C
		3 0 0 3

Course Description:

This course is about to learn ethical hacking and security challenges in computer networking. Which addresses the data security issues and types of attacks includes malwares, viruses, sniffer and denial of service. It teaches ethical responsibilities, professional integrity and making appropriate use of the tools and techniques.

Course Objectives:

The objective of this course is to make students to:

1. Know the concepts of hacking, ports and penetration testing
2. Understand the footprinting types and techniques of scanning
3. Understand the process of system hacking, trojans and backdoors
4. Apply the concepts of sniffing, packet analysis & session Hijacking
5. Learn the ethical issues and responsibilities associated with ethical hacking

UNIT I **9 Hrs**

Introduction to Hacking: Hacking, Types and phases of hacking. Introduction to Ports & Protocols: Ports, Protocols, Primary Network Types. Introduction to Penetration Testing: Penetration test, Categories and Types of Penetration tests, Structure of Penetration Test Report.

UNIT II **9 Hrs**

Footprinting: Footprinting, Types, Using ping and ns Lookup commands in Windows command line. Scanning: Scanning, Basics of Scanning, Basic Techniques of Scanning, Enumerating DNS using dns enum, Performing flag scan using hping3.

UNIT III **10 Hrs**

Issues Hacking into System: System Hacking, Password Cracking, Default password databases, Manual and Automated Password Cracking, Process of System Hacking, Using Keyloggers. Trojans & Backdoors: Trojans, Working of Trojan, Infection Techniques, Attack, Lifecycle and Classification of Virus, Worms, Virus Construction Kit.

UNIT IV **9 Hrs**

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

UNIT V **8 Hrs**

An introduction to the particular legal, professional and ethical issues likely to face the domain of ethical hacking. Ethical responsibilities, professional integrity and making appropriate use of the tools and techniques associated with ethical hacking.

Course Outcomes:

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

1. Explain the concepts related to hacking, ports and protocols, penetration testing
2. Determine the applicable footprinting techniques and scanning methods
3. Explain the process of system hacking and explain the concepts Trojans, backdoors, worms and virus and it's countermeasures
4. Demonstrate systematic understanding of the concepts of sniffing and cryptography
5. Understand the legal and professional responsibilities of ethical hacking

Text Books:

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

Reference Books:

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

TAUT1201E **FUNDAMENTALS OF COMPUTERS** **L T P C**
3 0 0 3

Course Description:

The course is designed to aim at imparting a basic level appreciation program. The incumbent can use the computer for basic purposes of preparing his personnel/business letters, viewing information on the Internet (the web), sending mail, using internet banking services, etc. and allows to become digitally literate.

Course Objectives:

The objective of this course is to make students to:

1. To introduce the fundamental concepts of computers, including their characteristics, types, and applications.
2. To explain the functional components of a computer and various input/output devices.
3. To understand different types of computer memory and storage devices.
4. To introduce computer languages and software, including algorithms and programming languages and provide an overview of operating systems and basic networking concepts.
5. To introduce the components and practical applications of MS Office.

UNIT I **9 Hrs**

Introduction to Computer: Computer Characteristics, Concept of Hardware, Software, Evolution of computer and Generations, Types of Computers–Analog and Digital computers, Hybrid Computers, General Purpose and Special Purpose Computers, Limitations of Applications of Computer in Various Fields.

UNIT II **9 Hrs**

Structure and Working of Computer: Functional Block Diagram of Computer. CPU, ALU, Memory UNIT-, Bus Structure of Digital Computer–Address, Data and Control Bus.

Input/Output Devices: Input Device– Keyboard, Mouse, Scanner, MICR,OMR. Output Devices–VDU, Printers– Dot Matrix, Daisy-wheel, Inkjet, Laser, Line Printers and Plotters.

UNIT III **9 Hrs**

Computer Memory: Memory Concept, Memory Cell, Memory Organization, Semiconductor Memory – RAM, ROM, PROM, EPROM, Secondary Storage Devices – Magnetic Tape, Magnetic Disk (Floppy Disk and Hard Disk.), Compact Disk.

Computer Language and Software: Algorithm, Flowcharts, Machine Language, Assembly Language, High Level Language, Assembler, Compiler, Interpreter. Characteristics of Good Language. Software – System and Application Software.

UNIT IV **9 Hrs**

Operating System: Operating System, Evolution of Operating System. Functions of Operating System. Types of Operating Systems. Detailed Study of Windows Operating System. Introduction and Features of LINUXOS.

Networking: Concept, Basic Elements of a Communication System, Data Transmission Media,Topologies, LAN, MAN, WAN, Internet

UNIT V **9 Hrs**

MSOffice: Introduction to MS Office, Components and Features. **MSWord:** Creating Letter, Table, Fonts, Page Layout Document**,** Formatting, Spell Check, Print Preview, Template, Color, Mail Merge, AutoText, Inserting Picture, WordArt.

MS Excel: Introduction to Excel, Sorting, Queries, Graphs, Scientific Functions.

PowerPoint: Introduction to PowerPoint, Creation of Slides, Inserting Pictures, Preparing Slide Show with Animation. **MS Access:** Creation and Manipulation of Files.

Course Outcomes:

Upon completion of the course, student will be able to:

1. Understand the basic characteristics, types, and applications of computers.
2. Comprehend the functional components and input/output devices of a computer.
3. Describe various memory types and secondary storage devices.
4. Differentiate between machine, assembly, and high-level languages and their associated tools. Understand the role and types of operating systems, with knowledge of Windows and Linux, and basic networking concepts.
5. Utilize MS Word, Excel, PowerPoint, and Access for practical applications.

Text Books:

1. Peter Norton: Computing Fundamentals.6th Edition, Mc Graw Hill-Osborne, 2007.
2. Sarita Dhawale, Thakur Akash Ashok: Fundamentals of Computer, Thakur Publication Pvt. Ltd.

Reference Books:

1. Deborah Morley and Charles S.Parker; Fundamentals of Computers; Cengage Learning, India edition; 2009.
2. Alex is Leon and Mathews Leon; Fundamentals of Information Technology; Vikas Publication, Chennai.
3. Francis Scheid; Theory and Problems of Introduction to Computer Science Schaum’s Outline Series; Tata Mc Graw Hill publication.

TAUT1201F **GENDER AND DEVELOPMENT** **L T P C**
3 0 0 3

Course Description:

The course is important for professionals from the point of creating engendered perspectives and sensitivity toward issues concerning women, men, and sexual minorities. It further reaffirms the belief in the importance of grassroots experiences and narratives while dealing with gender issues.

Course Objectives:

1. Understand key concepts, and issues in gender and development
2. Understand the social construction of gender and develop gender perspectives in analyzing social realities
3. Understand how the gender dynamics of power and inequality play out in the social institutions of households, markets, and states and within the arena of civil society.
4. Create awareness about the magnitude of gender disparities in the present context
5. Examine through the gender lens, the interlinkage between cultural practices social processes, and development approaches

UNIT I Basic Concepts and Theories of Feminism **10 Hrs**

Concepts- gender, gender studies, gender identity, gender role stereotyping, gender division of labor, gender discrimination, gender equality, and equity. Overview of feminist theories – Liberal feminism, Radical Feminism, Black feminism, postmodern feminism, Eco- feminism; The international background to the Women's Movement, The genesis of the Women's Movement in India. Contemporary Contestations – Intersex and Transgender Movements. •Feminist thinkers in the 18th, 19th, 20^{th}, and 21st Centuries.

UNIT II Gender Issues **10 Hrs**

Major gender issues – national and global - causes and consequences., LGBTQIA+ issues (Gender violence in private and public spaces: Domestic violence, Dowry, trafficking in women and children, rape, sex-selective abortion, female infanticide, female foeticide, child marriage, prostitution • Gender, leadership, and workplace; Sexual Harassment at Workplace). Gender-based violence, patriarchy, sexism, racism, casteism, economic inequality, and misogyny. Gender and health (Physical and mental), reproductive health, and sexuality. Feminization of poverty. Issues of the rights of sexual minorities and transgender - Article 377 and beyond.

UNIT III Gender Perspectives in Development **10 Hrs**

Gender Analysis Tools: Gender budgeting, Gender mainstreaming, SIG, Gender Parity Index, Gender Inequality Index, Human Development Index, Gender Development Index, Gender Empowerment Measure, Approaches to development-- Women in Development (WID), Women and Development (WAD), Gender and Development(GAD), Millennium Development Goals, and Sustainable Development Gender Analysis Frameworks; Gender blind; neutral and redistributive policies; Welfare, Efficiency and Empowerment approaches to Gender; Strategic and practical gender needs/interests; Case Studies to understand the engagement with gender, (Poverty alleviation Forestry; Drinking Water and Sanitation; Health programmes, Urban renewal and slum rehabilitation Programmes, and micro-credit programmes like SHGs.

UNIT IV Mechanisms Addressing Issues and Best Practices **10 Hrs**

Constitutional and legislative safeguards, policies, and programmes • Institutional mechanisms: National Commission for Women, Rashtriya Mahila Kosh, Crime Against Women Cell, Family Court, Family Counselling Centers and Crisis intervention centers • Best practices to address disparity, violence, and safety issues

International initiatives world conferences, women's decade, CEDAW. Indian initiatives – Towards Equality Report, National Perspective Plan for women, National Policy for the Empowerment of Women-2001, National and State women's Commissions, Nirbhaya, Women Development Corporation; Legal remedies and Social Welfare Services available to Women Facing Violence.

UNIT V Gender and Media **5 Hrs**

Discourse on Women and Media Studies- Mainstream Media, Feminist Media. • Coverage of Women's issues, sexual minorities, and issues of women in Mass Media and Media Organizations (Audio-Visual and Print media). • Digital Media and legal protection (cybercrimes and laws). • Alternative Media – Folk Art, Street Play and Theatre. • Indecent Representation of Women (Prohibition) Act, 1986, Pornography, Impact of media on Gender. Construction of masculinity and feminity in media.

Course Outcomes:

By the end of the course, students should be able to:

1. Understand the concept of gender and the social construction of feminity and masculinity
2. Develop sensitivity towards the existing practices leading to gender discrimination and marginalization in society.
3. Develop the ability to identify social, economic and political systems that adversely affect the well-being and functioning of women.
4. Suggest affirmative action in planning to promote gender equity, equality, and safety for women and sexual minorities
5. Understand the major theoretical and empirical issues that emerge in the gender field.

Text Books:

1. Nalini Visvanathan (Ed.), (2006) The Women, Gender and Development Reader, Zubaan, New Delhi
2. Kannabiran, Kalpana& Ritu Menon. 2007. From Mathura to Manorma: Resisting Violence Against Women, New Delhi: Women Unlimited

Reference Books:

1. Seth, M. 2001. Women and Development: The Indian Experience. New Delhi: Sage Publications.
2. Banerjee, N; S. Sen &N. Dhawan. 2011. Mapping the Field: Gender Relations in Contemporary India, Volume 1, Kolkata: Stree
3. Bose, C.E. &Minjeong Kim. 2009. Global Gender Research: Transnational Perspectives, New York: Routledge

Notes

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/#:~:text=There%20are%20many%20different%20gender,or%20a%20combination%20of%20these.
3. https://genderspectrum.org/articles/understanding-gender

TAUT1201G **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 **9 Hrs**
Understanding Leadership-Defining Leadership; Leadership styles, Entrepreneurial leaders, Different levels of leaders

UNIT II **9 Hrs**
Strategy formulation- formulation of vision, Strategy formulation and communication, role of the leader in managing change, foundation for effective team development

UNIT III **9 Hrs**
Leadership development approaches- 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 **9 Hrs**
Recognizing Leadership Traits-Historical Leaders; Traits Leaders Display, Leadership Studies: What Traits Do Effective Leaders Exhibit.

UNIT V **9 Hrs**
Recognising self - Exercises of Self-awareness using Johari Window, Development diaries, Feedback exercises, Personal vision setting

Course Outcomes:
1. Understand the basic concepts of leadership
2. Understand the significance of vision and strategy formulation
3. Knowledge of leadership development approaches.
4. Knowledge of leadership traits.
5. Knowledge of self-awareness techniques

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 & Franci

TAUT1201H **MATHEMATICAL THINKING** **L T P C**
3 0 0 3

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 easily be able to learn more problems solving skills and use this course for practicing. 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 Outcomes:

At the end of this course, the students will be able:

1. To familiarize the students with the fundamental concepts of basic numbers, mathematical operations, and divisibility rules
2. Summarize the basic concepts mathematical operations on numbers and calculate LCM, GCD to solve simple problems.
3. Compute To probability concepts and statistical methods in various applications engineering.
4. Understand the formula for evaluate the square root and cube root of different types numbers
5. Impart the arrangements and selections of things and counting numbers and check for independence of events.

UNIT I **9 Hrs**

Number system and Tests of Divisibility: Digits, numbers, Indian-Hindu-Arabic system, Roman Numbers, Face Value and Place values, Various Types of Numbers or Standard Numbers, Prime number, composite numbers, Perfect Numbers, Co-primes (or) Relative Primes, Twin primes, perfect numbers, Testing of prime numbers, Mathematical operations on even and odd numbers.

UNIT II **9 Hrs**

LCM and GCD or HCF: Factors and Multiplers, Highest Common Factor (H.C.F.) or Greatest Common Measure (G.C.M.) or Greatest Common Divisor (G.C.D.) factorization method, division method, finding the H.C.F. of more than two numbers, factorization method of finding L.C.M, H.C.F. and L.C.M. of fractions.

UNIT III **9 Hrs**

System Simplifications: BODMAS' Rule, Modulus of a Real Number, Virnaculum (or Bar), Algebraic identities, set theory operations (union, intersection, complements).

UNIT IV **9 Hrs**

Square Roots, Cube Roots, averages and percentages: Square Root, cube root, Problems on numbers, concept of averages, problems on averages, concept of percentage and problems on percentages.

UNIT V **9 Hrs**

Permutations, combinations and Probability: Fundamental principle with respect of addition and multiplication, permutations, combination, relation between permutation and combination, Random experiment, sample space and basic problems of events of a probability.

Course Outcomes:

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

1. To explain fundamental concepts of basic number system, including standard numbers, mathematical operations, and divisibility rules.
2. To apply mathematical operations on numbers and calculate lcm, gcd to solve simple problems.
3. To evaluate the arrangements and selections of things and counting numbers.
4. To understand the simplications by using identities and apply the different kinds of operations on the numbers.
5. To evaluate square root and cube root of different types numbers and calculate appropriate solutions for different problems.

Text Books:

1. Quantitative Aptitude Text Book, Dr.RS.Agrrwal.
2. Quantitative Aptitude, Text Book,S.Chandu.
3. Andhra Pradesh Academy of IPE text books.

Reference Books:

1. Quantitative Aptitude, Text Book, Quicker Mathematics ,second edition
2. Quantitative Aptitude, Text Book,Abjuirh guwaha,Fourth edition
3. www.online quantitative aptitude testseries.com
4. Quantitative Aptitude, GSR Publications,Gunturu,third edition
5. Quantitative Aptitude, verbal reasoning ,Guptha publication,3rd edition
6. www.enaduprathibaonline.com and www.sakshionlineseries.com

TAUT1201I **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 **03 Hrs**

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

UNIT II **12 Hrs**

Vital signs: 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 **8 Hrs**

Basic life support / basic cardiopulmonary life support (BLS/BCLS)

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

UNIT IV **12 Hrs**

Home care management of Diabetes and Hypertension

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 **10 Hrs**

Adolescent Health: Growth and Development of adolescent, Nutritional and developmental needs of adolescent, Common health problems including mental health problems, Reproductive and sexual health issues

Course Outcomes:

At the end of this course, students should be able to:

1. Acquire a thorough knowledge on concept of health and illness.
2. Demonstrate skills in monitoring the vital signs
3. Develop skills in performing BLS/BCLS
4. Able to attain knowledge and skills on treatment modalities of DM
5. Aware of normal Growth and development and common health problems in adolescent

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.

TAUT1201J **ONE HEALTH** **L T P C**
3 0 0 3

Course Description:

This course introduces students to the One Health approach, an interdisciplinary approach that recognizes the interconnectedness of human, animal and environmental health. Students will learn about the history of One Health, its relevance to global health and its role in addressing a range of health challenges, including zoonotic diseases, environmental health hazards and antimicrobial resistance. The course will also explore current and emerging One Health challenges and innovations and the ethical considerations of One Health research and practice.

Course Objectives:

1. To explain the relevance of One Health to global health.
2. To understand the interdisciplinary nature of One Health research and practice.
3. To analyze the impact of environmental health hazards on human and animal health.
4. To identify emerging One Health challenges and innovations.
5. To evaluate ethical considerations in One Health research and practice.

UNIT I **9 Hrs**

Overview of One Health and its relevance to global health, Definition of One Health and its history, Examples of One Health challenges, such as zoonotic diseases and antimicrobial resistance, The role of inter-disciplinarity in One Health research and practice, Global One Health initiatives and their impact

UNIT II **9 Hrs**

Environmental health and its relationship to One Health, Overview of environmental health and its impact on human and animal health, Environmental risks to health, such as pollution and climate change, Case studies highlighting the impact of environmental hazards on human and animal health, The role of One Health in addressing environmental health challenges

UNIT III **9 Hrs**

Zoonotic diseases and One Health, Overview of zoonotic diseases and their impact on human and animal health, The ecology of zoonotic diseases and how they emerge and spread, Case studies of major zoonotic disease outbreaks, such as Ebola and COVID-19, The One Health approach to preventing and controlling zoonotic diseases.

UNIT IV **9 Hrs**

Antimicrobial resistance and One Health, Overview of antimicrobial resistance and its impact on human and animal health, the relationship between antimicrobial use in animal agriculture and human health, the role of One Health in addressing the global challenge of antimicrobial resistance, Case studies of One Health approaches to controlling antimicrobial resistance, such as the WHO Global Action Plan

UNIT V **9 Hrs**

Future directions in One Health research and practice, Emerging One Health challenges-food security and emerging infectious diseases, Innovations in One Health research and practice, such as digital technologies and genomics, Opportunities for One Health collaboration across sectors and disciplines, Ethical considerations in One Health research and practice.

Course Outcomes:

By the end of the course, students will be able to:

1. Describe the One Health approach and its relevance to global health
2. Analyze the impact of environmental health hazards on human and animal health
3. Evaluate the role of One Health in addressing zoonotic diseases and controlling antimicrobial resistance
4. Identify emerging One Health challenges and innovations
5. Discuss ethical considerations in One Health research and practice

Text Books:

1. One Health: People, Animals and the Environment by Ronald M. Atlas and Stanley Maloy
2. One Health: The Human-Animal-Environment Interfaces in Emerging Infectious Diseases by John S. Mackenzie and Martyn Jeggo

Reference Books:

1. One Health: The Theory and Practice of Integrated Health Approaches edited by Jakob Zinsstag, Esther Schelling, David Waltner-Toews and Maxine Whittaker
2. One Health and the Politics of Antimicrobial Resistance edited by Laura H. Kahn, Bruce Kaplan and Thomas P. Monath
3. The One Health Initiative: A Global Movement to Achieve Sustainable Health and Well-being edited by Bruce Kaplan and Thomas P. Monath.

TAUT1201K 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

Course Outcomes:

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.
2. Apply essential first aid skills.
3. Demonstrate the use of AED in Emergencies.
4. Demonstrate the practical aspects of CPR
5. Evaluate various assessment plans by the specific emergency.

Text Books:

1. "Basic Life Support Provider Manual" by American Heart Association Pang, Ning Tan, Michael Steinbach and Vipin Kumar "Introduction to Data Mining", Pearson Education, 2007.
2. "First Aid Manual" by St. John Ambulance

TAUT1201L **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

Course Outcomes:

At the end of this course, students should be able to:

1. Perform basic life support techniques.
2. Administer essential first aid.
3. Recognize and manage stroke symptoms and treatments.
4. Understand and address non-communicable diseases.
5. Implement communicable disease control measures.

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.

TAUT1201N **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.

Course Outcomes:

1. Basic understanding of entrepreneurship
2. Knowledge of idea generation and opportunities identification of entrepreneurship
3. Understand different forms of enterprises
4. Understand different emerging trends of entrepreneurship
5. Knowledge of different financial institutions

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

TAUT1201O **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 **9 Hrs**

Introduction: 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 **9 Hrs**

Production: 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 **9 Hrs**

Cost & Break-Even Analysis - 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 **9 Hrs**

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

UNIT V **9 Hrs**

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

Course Outcomes:

1. Basic understanding of managerial economics
2. Develop an understanding of the applications of production
3. Interpret cost analysis
4. Understand different forms of business organizations.
5. Analyse the causes and consequences of different market conditions.

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 AgeInternational, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, NewDelhi.

TAUT1201P **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.

Course Outcomes:

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.
2. Critically evaluate the sustainability of different agricultural practices, considering environmental impact, economic viability, and social equity.
3. Design and implement an organic farming plan for a specific crop or agricultural enterprise.
4. Analyze case studies and research articles to assess the effectiveness of organic farming practices in various contexts.
5. Communicate effectively about organic farming principles and practices, both orally and in writing.

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

TAUT1201Q **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

Course Outcomes:

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.
2. Exhibit improved verbal and non-verbal communication skills.
3. Apply strategies to boost self-confidence and maintain high self-esteem.
4. Implement effective time management techniques to enhance productivity.
5. Develop and demonstrate leadership qualities in various scenarios.

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.

TAUT1201R **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 **9 Hrs**

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

UNIT II **9 Hrs**

Drivers and scope: 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 **9 Hrs**

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

UNIT IV **9 Hrs**

Elements of a Marketing Conception- Market analysis, Marketing Goals, Competitive Strategy, Measures, Controlling; Peculiarities Concerning Marketing for Social Enterprises, Marketing Importance for Social Enterprises.

UNIT V **9 Hrs**

Finance- 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

Course Outcomes:

1. Knowledge of social entrepreneurship differentiation from other related concepts
2. Understand the role of social entrepreneurship in societies, economies and politics
3. Analysis of different types of partners for social entrepreneurs.
4. Understand the typical process steps of a marketing conception.
5. Awareness of the peculiarities of financial elements in social enterprises

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

II SEMESTER

BTCT1703 **PROBABILITY & STATISTICS** **L T P C**

3 1 0 4

Course Description:

Topics include averages, measures of variation, frequency distributions and probability functions associated with random variables, binomial distributions, sampling, the normal curve and statistical methods available for decision making.

Course Objectives:

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

UNIT I **12 Hrs**

Descriptive Statistics: 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 **12 Hrs**

Probability: Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye’s theorem, random variables (discrete and continuous), probability density functions, properties.

UNIT III **12 Hrs**

Probability distributions: Discrete distribution - Binomial, Poisson approximation to the binomial distribution and their properties. Continuous distribution: normal distribution and their properties.

UNIT IV **12 Hrs**

Estimation and Testing of hypothesis, large sample tests: Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two 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 interval for parameters in one sample and two sample problems.

UNIT V **12 Hrs**

Small sample tests: Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes.

Course Outcomes:

Upon successful completion of this course, the student should be able to

1. Compute descriptive statistics using numerical techniques and explain the characteristics through correlation and regression tools.
2. Apply probability theory to find the chances of happening of events.
3. Understand various probability distributions and calculate their statistical moments.
4. Solve the problems on testing of hypothesis on large samples.
5. Solve the problems on testing of hypothesis on small samples.

Text Books:

1. Miller and Freunds, Probability and Statistics for Engineers, 7/e, Pearson, 2008.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:

1. S. Ross, a First Course in Probability, Pearson Education India, 2002.
2. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.
3. Peyton Z. Peebles, Probability, Random Variables & Random Signal Principles - McGraw Hill Education, 4th Edition, 2001.

BTCT1802 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING L T P C
3 1 0 4

Course Description:

This course introduces to the concepts and definitions of Ohms law, KCL, KVL, power and energy. By applying Kirchhoff's current and voltage laws to circuits in order to determine voltage, current and power in branches of any circuits excited by DC voltages and current sources. Apply simplifying techniques to solve DC circuit problems using basic circuit theorems and structured methods like node voltage and mesh current analysis. This course also introduces the basic electronics components like Logic gates, Flip lops etc. This course also introduces the construction and operating principle of AC machines, DC machines, Generators and Transformers.

Course Objectives:

1. To introduce the basics of electric circuits and DC Machines analysis
2. To impart knowledge in the basics of AC Fundamentals
3. To introduce analog devices and their characteristics
4. To educate on the fundamental concepts of digital electronics
5. To introduce the functional elements and working of measuring instruments

UNIT I Fundamentals of Electrical Engineering and DC Machines: 12 Hrs

Ohm's Law, Kirchhoff's Laws, types of sources, passive elements. Series parallel circuits, mesh and nodal analysis. Superposition, Reciprocity theorem.

DC Machines: Principle of operation of D.C generators, types, E.M.F equation. Principle of operation of D.C motors, Types motors, Torque equation, Losses and efficiency, simple problems on D.C Generators and motors.

UNIT II Fundamentals of AC circuits: 12 Hrs

AC voltage wave form and basic definitions: Peak Value, R.M.S. value, Average values, Form factor and Peak factor, 'j' operator, Analysis of single-phase AC circuits series and parallel (Simple circuits). Three phase circuits – Star - delta connection, Relation between line and phase voltages / currents in a 3-phase Star-Delta balanced system

UNIT III Induction Motors and Measuring Instruments: 12 Hrs

Concept of Faraday's laws, 3- phase induction motor working principle, operation and construction details.

Instruments: Introduction, classification of instruments, operating principles, essential features of measuring instruments, permanent magnet moving coil (PMMC) instruments, moving iron (MI) instruments.

UNIT IV Diode and Transistor: 12 Hrs

Overview of Semiconductors, PN junction diode and Zener diode –Diode circuits: rectifiers (bridge type only), filters, clippers and clampers. BJT construction, operation, characteristics (CB, CE and CC configurations) and uses – JFET and MOSFET construction, operation, characteristics (CS configuration) and uses.

UNIT V Digital Electronics: **12 Hrs**

Number systems – binary codes –binary arithmetic - Boolean algebra, laws & theorems - simplification of Boolean expression using K maps - logic gates - implementation of Boolean expressions using logic gates - standard forms of Boolean expression.

Course Outcomes:

On successful completion of the course, the students will be able to –

1. Understand the basic terminology/definitions of electrical and electronics engineering
2. Apply the knowledge of theorems/laws to analyze the simple circuits
3. Use the principles of electromagnetic induction in electrical applications.
4. Construct and analyze simple AC circuits.
5. Select the electrical machines for different applications.

Text Books:

1. Basic Electrical Engineering –T.K. Nagesarkar and M.S. Sukhja, Oxford University Press.2nd edition.
2. Basic Electrical & Electronics Engineering –T.K. Nagesarkar and M.S. Sukhja, Oxford University Press.2nd edition.
3. Principles of Electronics - V. K. Mehta, S. Chand Publications, 2nd edition.

References Books:

1. Theory and problems of Basic electrical Engineering- D. P. Kotahari & I. J. Nagrath PHI.
2. Electronic Devices and Circuits, Millman & Halkias, TMH publications.
3. Electrical Machinery Dr. P.S. Bimbhra, Khanna Publication First Edition 2021.

BTCT1301 **DATA STRUCTURES** **L T P C**

3 1 0 4

Course Description:

The basic idea to introduce this course is to make students to explore several techniques, algorithms to store, organize data and will include linked lists, stacks, queues, graphs and trees. Study and analysing of the various data structures gives complete awareness to use them in various applications.

Course Objectives:

The objective of this course is to make students to:

1. Impart the basic concepts of data structures and expected to know the Abstract Data Type, and difference between linear and non-linear data structures
2. Learn implementing concepts about Stacks, Queues
3. Enable them to write algorithms for operations of various linked lists
4. Choose appropriate searching and sorting technique based on the problem to be solved
5. Understand basic concepts about trees, graphs and its applications

UNIT I **12 Hrs**

Introduction to Data Structures: Definition of Data Structures, Abstract Data Type, Classification of Data Structures- Linear and Non-Linear, Applications, Data Structure Operations: insertion, deletion, search, traversal.

UNIT II **12 Hrs**

Stacks and Queues: Stack ADT and its operations, Array representation of stacks, Stack applications - Reversing Data, Infix to Postfix Transformation, Postfix expression evaluation. Queue ADT and its Operations, Array representation of Queues, Queue Types: Circular Queues, Priority Queue, Dequeue, Applications of Queues. Dynamic Memory Allocation.

UNIT III **12 Hrs**

Linked Lists: Concepts of Linked Lists, Types of Linked Lists, Singly Linked lists: Operations & its implementation, Linked representations of Stacks & Queues, Concatenating two lists, Doubly Linked List: Operations & its implementation, Circularly Linked List, Application of Linked Lists.

UNIT IV **12 Hrs**

Searching and Sorting: Searching: Linear Search and Binary Search Techniques. Sorting: objectives and properties of different sorting algorithms: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort.

UNIT V **12 Hrs**

Trees and Graphs: Trees: Basic Tree Terminologies, Different types of Trees: Binary Trees, Binary Tree Traversals, Applications of Binary Trees, Binary Search Trees, Spanning Trees. Graphs: Basic Terminologies and Representations - Adjacency Matrix, Adjacency List, Graph Traversals, Applications.

Course Outcomes:

After completion of this course student will be able to:

1. Demonstrate the concepts of Abstract data type and can differentiate different between linear and non-linear data structures.
2. Implement Stacks and Queues for a given problem.
3. Create programs for Linked lists using various operations.
4. Select the data structure that efficiently model the information in a problem
5. Describe the concepts of trees, graphs and their applications.

Text Books:

1. Richard Gilberg, Behrouz Forouzan, ―Data Structures: A P seudocode Approach with C (Data Structures Series), Second Edition, Cengage Learning, 2004.
2. Gav Pai, ―Data Structures and Algorithms – Concepts, Techniques and Applications‖, Tata McGraw Hill, 2008.

Reference Books:

1. A. A. Puntambekar, ―Data Structures Using C, First Edition, Technical Publications, 2009.
2. E Balagurusamy, ―Data Structures Using C, Tata McGraw-Hill Education, 2013.

BTCT1302 **PYTHON PROGRAMMING** **L T P C**

3 1 0 4

Course Description:

This course was introduced to make students to learn Python language and programming constructs like loops, conditionals, data structures, and modules. Familiarizes the various tools to run and write Python scripts, and student can develop code quickly, it dives deeper into essential programming topics which helps the students to solve the complex real time problems.

Course Objectives:

The objective of this course is to make students to:

1. Know the basic concepts of python and to run the python scripts
2. Develop python programs with different operators, conditions and loops
3. Use python data structures sequences
4. Define and create python functions, modules, packages and make use of them
5. Learn object-oriented programming concepts

UNIT I **12 Hrs**

Introduction: History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

UNIT II **12 Hrs**

Types, Operators and Expressions: Types - Integers, Strings, Booleans; Operators-Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue, pass.

UNIT III **12 Hrs**

Data Structures: Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions, strings and basic operations of strings.

UNIT IV **12 Hrs**

Functions: Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.

Modules: Creating modules, import statements, from. Import statement, name spacing.

Python packages: Introduction to PIP, Installing Packages via PIP, Using Python Packages.

UNIT V **12 Hrs**

Object Oriented Programming OOP in Python: Classes, 'self-variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding,

Error and Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions.

Course Outcomes:

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

1. Develop and run simple Python programs for solving problems
2. Demonstrate the python programs using various basic concepts
3. Represent compound data using Python lists, tuples, and dictionaries
4. Install python packages and can create and decompose python programs into functions and modules
5. Demonstrate the object-oriented concepts

Text Books:

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
2. Learning Python, Mark Lutz, Orielly.

Reference Books:

1. Think Python, Allen Downey, Green Tea Press.
2. Core Python Programming, W.Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert, Cengage.

TAUT1102 **ENVIRONMENTAL STUDIES** **L T P C**
3 0 0 0

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 recourses in future days, and address the gaps in the eco system.

Course Objectives:

Students undergoing this course are expected to:

1. Understand eco system and scope of multidisciplinary
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 **8 Hrs**

Multidisciplinary nature of environmental studies; 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 **8 Hrs**

Ecosystems: Concept of an ecosystem.; Introduction, types, characteristic features, structure and function of the following ecosystem: - 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 **8 Hrs**

Biodiversity and its conservation: Introduction – Definition- genetic, species and ecosystem diversity.; Biogeographical classification of India; India as a mega-diversity nation; Hot-sports 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 **8 Hrs**

Environmental Pollution 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 **8 Hrs**

Social Issues and the Environment: 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; awareness campaign; special lectures by experts; quiz, debate competitions, short film Contest, rally etc

Course Outcomes:

At the end of this course, students should be able to:

1. Understand key concepts from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
2. Appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving.
3. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
4. Reflect critically about their roles and identities as citizens, consumers and environmental activists
5. Be part in Development goals and educating the communities.

Text Books:

1. Textbook of Environmental Studies (English, Paperback, Asthana D. K.) S.Chand & co , New Delhi
2. Textbook of Environmental Studies for Undergraduate Courses, Erach B Haruchu, UGC, KINDLE Edition, Amazon.

Reference Book:

1. Encyclopedia of Environment and Society- set of 5 volumes, Sage Publications

BTCL1802 BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB L T P C
0 0 2 1

Course Description:

In this lab, the students of all engineering streams are trained on basic concepts of electrical engineering such as AC to DC conversion, measurement, transformer, verification of basic laws and theorems, use of CRO, DSO, etc. And also electronics circuits design with diodes, transistors applications like clippers, amplifiers etc.

Course Objectives:

1. Understand the Thevenin's networks,
2. DC Machines Speed Control, Brake test, No load test, simple test on single phase transformer and 3-phase Induction motor.
3. Understand the nature and scope of modern electronics, describe physical models of basic components, design and construct simple electronic circuits to accomplish a specific function.
4. Identify, Specify and test Active Devices, Diodes, BJTs, Low power JFETs.
5. Verify the Transistor CE characteristics and application as an amplifier.

Part A: Electrical experiments

1. Verification of Thevenin's Theorem.
2. Speed control of DC shunt motor by: a) Armature Voltage Control
   b) Field flux control method.
3. Brake test on DC shunt motor.
4. Swinburn's test on DC shunt machine.
5. OC & SC tests on Single – Phase transformer (Predetermination of efficiency and regulation at given power factors).
6. Brake test on 3-phase induction motor (performance characteristics).

Part B: (Electronics Laboratory experiments)

1. Identification of various electronic components and Devices
   Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Bread Boards.
2. Identification and Specifications of Active Devices like Diodes, BJTs, JFET etc.
   Study and operation of
3. Digital Multi meters
4. Function Signal Generator
5. Regulated Power Supplies
6. Study and Operation of CRO: Measurement of amplitude and frequency. Time Period measurement
7. PN Junction and Zener diode characteristics A. Forward bias B. Reverse bias.
8. Half wave and Full wave Rectifiers.
9. Transistor CE characteristics (Input and Output)
10. FET characteristics
11. CE Amplifier

Course Outcomes:

After completing this course, the student will be able to:

1. Understand the Thevenin’s Theorem in circuit analysis, speed control methods of DC motor with and without loading along with performance, working of single-phase transformer at no load conditions, the performance of three phase induction motor, different.
2. Identify, Specify and test R, L, C Components (Colour Codes), Potentiometers, Switches, Coils, Relays.
3. Explain and demonstrate working of PN Junction and Zener diode.
4. Explain and demonstrate working Half and Full wave Rectifier without filters.
5. Demonstrate working of CE characteristics and its application as an amplifier.

Text Books:

1. Ashfaq Hussain, Fundamentals of Electrical Engineering, Dhanpatrai & Co. (P) Ltd., 3rdedition, New Delhi, 2009.
2. B.L. Theraja, A.K. Theraja, A Text book of Electrical Technology, Volume 1, S Chand Technical Publications, First edition,2005.

References Books:

1. D. Roy Chowdhury, Linear Integrated Circuits, New Age International Pvt. Ltd., 4th edition, 2011.
2. Principles of Electronics - V. K. Mehta, S. Chand Publications, 2nd edition.
3. R. L. Boylestad and Louis Nashelsky, Electronics Devices and Circuits, PHI, 11th edition, 2009.

BTCL1301	DATA STRUCTURES LAB	L T P C
		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 main objective of conducting this lab is to enable the students to:

1. Get practical knowledge of data structures learned in the class room.
2. Extend programming ability using a structured programming approach.
3. Build and manipulate linear and non-linear data structures, including stacks, queues, linked lists, trees and graphs.
4. Analyse the concept of Tree and Graph Traversal.
5. Choose the appropriate data structure to use in solving the typical computer science problems.

1. Write a C program that implements Stack & Queue operations using arrays
2. Write a C program that uses Stack operations to perform the following
   a) Converting Infix expression to Postfix expression.
   b) Evaluating the Postfix expression.
3. Write a C program that implements Circular Queue and Dequeue operations using Arrays.
4. Write a C program that implements Stack & Queue operations using Pointers
5. Write a C program that uses functions to perform the following operations on singly linked list.
   i) Creation ii) Insertion iii) Deletion iv) Traversal
6. Write a C program that uses functions to perform the following operations on doubly linked list.
   i) Creation ii) Insertion iii) Deletion iv) Traversal
7. Write a C program that uses functions to perform the following operations on circular linked list.
   i) Creation ii) Insertion iii) Deletion iv) Traversal
8. Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers:
   i) Linear search ii) Binary search
9. 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
10. 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

Course Outcomes:

After Completing this lab, the student must be able to:

1. Demonstrate the algorithms of various data structures.
2. Emphasize the specification of each data structure as an abstract data type before discussing implementations and application of the structure.
3. Aware of the importance of dynamic allocation and operations of linked lists.
4. Solve the problems by selecting appropriate searching and sorting method.
5. Analyse the tree and graph traversal techniques

Text Book:

1. Data Structures: A Pseudo code Approach with C, 2nd Edition, R. F. Gilberg and B. A. Forouzan, Cengage Learning.

Reference Books:

1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and
2. Susan Anderson Freed, Universities Press.
3. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, PHI/Pearson Education.

BTCL1302	PYTHON PROGRAMMING LAB	L T P C
		0 0 2 1

Course Description:

This lab provides coding exercises on various commonly used concepts like, data structures, writing custom functions, and reading and writing to files. With the gain of the knowledge the students can solve the real-world problems quickly using python constructs and can develop simple html pages.

Course Objectives:

The objective of conducting this lab is to enable the students to:

1. Understand python programming basics and paradigm.
2. Learn and develop python looping, control statements and string manipulations.
3. Get familiar with the concepts of data structures and should organize, retrieve the data.
4. Know the concepts of file handling and modular programming.
5. Develop the programs using multi dimension lists and creation of simple html pages.

1. Basics & operations

a) Running instructions in Interactive interpreter and a Python Script.

b) Write a program to purposefully raise Indentation Error and correct it.

c) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem).

d) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

2. Control Flow

a) Write a Program for checking whether the given number is a even number or not.

b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . ,1/10.

c) Write a program using a for loop that loops over a sequence. What is sequence?

d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

3. Control Flow - Continued

a) Find the sum of all the primes below 200.

Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:

1, 2, 3, 5, 8, 13, 21, 34, 55, 89,...

b) By considering the terms in the Fibonacci sequence whose values do not exceed 400, find the sum of the even-valued terms.

4. DS

a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure

b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

c) Write a program combining lists that combines these lists into a dictionary.

d) Write a program to count the frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

5. Files

a) Write a program to print each line of a file in reverse order.

b) Write a program to compute the number of characters, words and lines in a file.

6. Functions

a) Write a function ball collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.

Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius

If (distance between two balls centers) <= (sum of their radii) then (they are colliding)

b) Find mean, median, mode for the given set of numbers in a list.

7. Functions - Continued

a) Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.

b) Write a function dups to find all duplicates in the list.

c) Write a function unique to find all the unique elements of a list.

8. Functions - Problem Solving

a) Write a function cumulative product to compute cumulative product of a list of numbers.

b) Write a function reverse to reverse a list. Without using the reverse function.

c) Write a function to compute gcd,lcm of two numbers. Each function shouldn't exceed one line.

9. Multi-D Lists

a) Write a program that defines a matrix and prints.

b) Write a program to perform addition of two square matrices.

c) Write a program to perform multiplication of two square matrices.

10 - Modules

a) Install packages requests, flask and explore them using (pip).

b) Write a script that imports requests and fetches content from the page Eg. (Wiki).

c) Write a simple script that serves a simple HTTP Response and a simple HTML Page.

Course Outcomes:

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

1. Acquire the knowledge to develop basic Python scripts.
2. Implement the python scripts using conditional and looping statements.
3. Format the data and can organize, retrieve, modify the data easily.
4. Manipulate the files and can simplify the code by modularizing.
5. Install packages and can write scripts to develop simple HTML pages.

Reference Books:

1. Think Python, Allen Downey, Green Tea Press.
2. Core Python Programming, W.Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert, Cengage.

University Elective – II
(Semester -II)

TAUT1202C **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, क्रर्शेषण, क्रर्शेषण के प्रकार
2. लिंग, वचन, काल, वाच्य, अर्थ, विलोम शब्द, शब्दों का वाक्य में प्रयोग
3. हिंदी सीखने की आर्श्यकता बताते हुए छोटी बहन के नाम पर पत्र।,
   विहार यात्रा का वर्णन करते हुए अपने ममत्र के नाम पत्र।,
   शूल्क भरने के लिए पैसे भेजने अपने क्रपता के नाम पत्र।
4. कफन - प्रेमचंद, वापसी - उषा प्रियम्वदा यशपाल - परदा
5. यरकान्त त्रिपाठी निराला - जूही की कली,महादेवी वर्मा - मैं नीर भरी दुख की बदली,
   सुममत्रानंदन पंत - भारत माता

UNIT I **9 Hrs**
1. संज्ञा, संज्ञा के प्रकार
2. सर्वनाम, सर्वनाम के प्रकार
3. क्रिया, क्रिया के प्रकार
4. विशेषण, विशेषण के प्रकार

UNIT II **9 Hrs**
1. लिंग,वचन, काल,कारक
2. अर्थ, विलोम शब्द
3. शब्दों का वाक्य में प्रयोग

UNIT III (पत्र लेखन) **9 Hrs**
1. हिंदी सीखने की आवश्यकता बताते हुए छोटी बहन के नाम पर पत्र।
2. विहार यात्रा का वर्णन करते हुए अपने मित्र के नाम पत्र।
3. शूल्क भरने के लिए पैसे भेजने अपने पिता के नाम पत्र।

UNIT IV (कहानी और कहानीकार) **9 Hrs**
1. कफन - प्रेमचंद
2. वापसी - उषा प्रियम्वदा
3. यशपाल - परदा

UNIT V (कवि और कविता) **9 Hrs**
1. सूर्यकांत त्रिपाठी निराला - जूही की काली
2. महादेवी वर्मा - मैं नीर भरी दुख की बदली
3. सुमित्रानंदन पंत - भारत माता

Course Outcomes:

1. बच्चों में पढने का क्षमता बढाना
2. लिखने की क्षमता बढाना
3. बोलने की क्षमता बढाना
4. भाषा के प्रक्रत रुलच उत्पन्न कराना
5. दैनंददन जीर्न में भाषा का प्रयोग करना

Text Books:

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

Reference Books:

विविधि प्रकार के कहानी और व्याकरण के किताबें संदर्भ ग्रंथ सूची

1. हिन्दी व्याकरण -कांता रानी मंजूषा,हरदेव बिहारी

2.विश्वनाद प्रसाद तिवारी - हिंदी कविता

3.विश्वनाद प्रसाद तिवारी- आधुनिक हिंदी कविता

4.पुष्पपाल सिंह - समकालीन हिंदी कविता

TAUT1202D **PROFESSIONAL ENGLISH** **L T P C**
3 0 0 3

Course Description:

This course aims to enhance the English language proficiency of engineering students in professional contexts. Through a combination of theoretical knowledge and practical exercises, students will develop their skills in technical writing, oral communication, presentation, and critical thinking. The course will focus on various aspects of professional communication, including report writing, academic writing, technical presentations, and effective communication in interdisciplinary teams. Additionally, students will engage with real-world engineering scenarios to apply language skills in practical contexts.

Course Objectives:

Students undergoing this course are expected to:

1. Develop proficiency in technical writing for engineering reports, research proposals, and documentation.
2. Enhance oral communication skills for effective presentations, meetings, and discussions and thereby improve their employability skills.
3. Improve critical thinking and analytical skills through the evaluation of technical information and arguments.
4. Foster teamwork, collaboration skills in interdisciplinary engineering projects.
5. Develop awareness of cultural and linguistic diversity in professional settings.

UNIT I **9 Hrs**

Pronunciation: Course techniques include recordings, partner work, group activities and one-on-one instructor feedback. Your speech will become clearer, more fluent and easier to understand. You'll improve your enunciation of individual sounds, intonation, stress patterns, pace and pausing.

UNIT II **9 Hrs**

Speaking Professionally: You'll build greater confidence through individual work, group interaction and feedback from your peers and instructor. To express yourself more clearly and concisely, whether you are speaking in impromptu situations or making well-planned Presentations. Focus on language that familiarizes you with the use of English in everyday situations and contexts.

UNIT III **9 Hrs**

Refine Your Grammar: Express yourself more accurately and eloquently by improving your English Grammar. You'll get the strong foundation you need to write and speak more clearly, precisely and persuasively. You'll explore the relationship between words in sentences, and analyse structure and meaning, clarify common problem points and improve punctuation. You'll have the opportunity to practice with your peers and get helpful feedback. You'll also learn what resources are best for ongoing grammar help. You'll apply them to produce effective, concise written work with newfound confidence. You'll express yourself more clearly and persuasively by using varied, well-structured sentences and placing content more strategically. You'll also develop editing skills to rid your work of errors.

UNIT IV **9 Hrs**

Writing Essentials – Professional Writing

Improve your written English for personal, professional and academic purposes. You'll refine your sentence structure, punctuation and verb tenses, and eliminate the most common errors that confuse readers. You'll enhance your writing style. Develop editing skills that help you revise your work. Lectures, discussions, e-learning tools and assignments will help you develop the communication skills you'll need in today's business environment.

UNIT V **9 Hrs**

You'll be equipped to create power packed Power Point Presentations. Be in better stead to introducing yourself. To know the nuances that goes into the presenting of information, and articulating information. Know how to make an impressive introduction. To imbibe Life Skills that is necessary to lead a fruitful and a fulfilling life.

Course Outcomes:

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

1. To understand the importance of Professional English in work place and learn the correct pronunciation and delivery of speech.
2. To read technical proposals properly and make them to write good technical reports.
3. To achieve better comprehending skills, vocabulary and professional speaking skills.
4. To learn and identify the Common Errors in Writing and Speaking.
5. Acquire digital competence, employment and workplace communication skills.

Text Books:

1. Technical Communication: Process and Product by Sharon J. Gerson and Steven M. Gerson
2. Engineering Communication: From Principles to Practice by David Ingre, C. O'Brien
3. Technical Writing Basics: A Guide to Style and Form by Brian R. Holloway

Reference Books:

1. The Encyclopaedia Britannica" - A comprehensive general encyclopaedia covering a wide range of topics.
2. The Oxford English Dictionary (OED)" - A comprehensive dictionary of the English language.

TAUT1202A **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 **9 Hrs**
Introduction to France and its regions - French alphabets and numbers, countries and nationality
Grammaire – Verbs – s'appeler, être, avoir, definite and indefinite articles
Communication – Greetings, Self Introduction

UNIT II **9 Hrs**
Basic vocabulary, colours, months and days
Grammaire - Verbes - Conjugation : Present tense (ER, IR, RE ending verbs) – Adjective possesive Communication – Talk about family and friends, date, time etc.

UNIT III **9 Hrs**
Hobbies, interests and daily routine
Grammaire – Irregular verbs – Releflexive verbs - Future proche
Communication – Talking about hobbies and interests

UNIT IV **9 Hrs**
Vocabulary of places and transport
Grammaire – Pertinent verbs, adjective demonstrative, past tense, propositions
Communication – Narrating an incident or story

UNIT V **9 Hrs**
Vocabulary of food, services, money
Grammaire – Negation, Verbs – acheter, manger, payer, articles partitifs. Communication – Accept and refuse an invitation, situation in a restaurant

Course Outcomes:
After the course, the students will be able to:
1. Acquire familiarity in the French alphabet & basic vocabulary
2. Listen and identify individual sounds of French
3. Use basic sounds and words while speaking
4. Read and understand simple advertisements, brochures and invitations
5. Understand and use basic grammar and appropriate vocabulary in completing language tasks

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

TAUT1202B **GERMAN** **L T P C**
3 0 0 3

Course Description: German Language Training

Course Objectives:

1. Importance of German Language in Global prospective
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 the Native German Speakers

UNIT I **9 Hrs**

GUTEN TAG!: 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 **9 Hrs**

FRUENDE, KOLLEGEN UND ICH: 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 **9 Hrs**

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

UNIT IV **9 Hrs**

GUTEN APPETIT!: Talking about food, planning a trip to the grocery store, food and meals and talking about it, verbs that require the accusative

UNIT V **9 Hrs**

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

Course Outcomes:

1. Basic Reading skills
2. Basic Writing skills with basic Grammar
3. Speaking skills and to do advance German Course
4. Understanding basic German for Daily Communication
5. Awareness of European Union and opportunities in Europe

Text Book:

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

III SEMESTER

BTCT2701 DISCRETE MATHEMATICS AND GRAPH THEORY

L	T	P	C
3	1	0	4

Prerequisite: Basic Mathematics

Course Description:

The purpose of this course is to understand and use (abstract) discrete structures that are backbones of computer science. Introduce the concepts of mathematical logic and gain knowledge in sets, relations and functions and Solve problems using counting techniques and combinatorics and to introduce generating functions and recurrence relations. Use Graph Theory for solving real world problems.

Course Objectives:

1. To explain about the Algebra, Graph theory and Recurrence relations.
2. To demonstrate the application of basic methods of discrete mathematics in Computer Science problem solving.
3. To elucidate solving mathematical problems from algorithmic perspective.
4. To introduce the mathematical concepts which will be useful to study advanced courses Design and Analysis of Algorithms, Theory of Computation, Cryptography and Software Engineering etc.
5. To reveal how solutions of graph theory can be applied to computer science problems

UNIT I **12 Hrs**

Mathematical Logic:

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 II **12 Hrs**

Set Theory:

Basic Concepts of Set Theory, Relations and Ordering, Functions composition of functions, Inverse Functions, Lattices and its properties. Algebraic structures: Algebraic Systems-Examples and General Properties, Semi groups and Monoids, groups, sub groups, homomorphism, Isomorphism.

UNIT III **12 Hrs**

Elementary Combinatorics:

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

UNIT IV **12 Hrs**

Recurrence Relations:

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

UNIT V **12 Hrs**

Graphs:

Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem

Course Outcomes:

After completion of the course, students will be able to

1. Apply mathematical logic to solve problems.
2. Understand the concepts and perform the operations related to sets, relations and functions, gain the conceptual background needed and identify structures of algebraic nature.
3. Apply basic counting techniques to solve combinatorial problems.
4. Formulate problems and solve recurrence relations.
5. Apply Graph Theory in solving computer science problems.

Text Books:

1. Joe L. Mott. Abraham Kandel and Theodore P. Baker, "Discrete Mathematics for Computer Scientists & Mathematicians", 2nd Edition, Pearson, 2008. (For Units III to V).
2. J P Trembly and R Manohar, "Discrete Mathematical Structures with Applications to Computer Science", 1st Edition, McGraw Hill, 2017(For Unit I&II).

Reference Books:

1. Ralph P. Grimaldi and B.V. Ramana, "Discrete and Combinatorial Mathematics, an Applied Introduction", 5th Edition, 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", Ist Edition, Cenegage Learning, 2012.
4. C L Liu and D P Mohapatra, "Elements of Discrete Mathematics, A computer Oriented approach", 4th Edition, MCGRAW-HILL, 2018.

BTCT2301 DESIGN AND ANALYSIS OF ALGORITHMS L T P C
3 1 0 4

Prerequisite: Data Structures

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 algorithm, asymptotic complexity, sorting and searching using divide and conquer, greedy method, dynamic programming, backtracking, branch and bound. 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. 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 12 Hrs
Introduction
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.

UNIT II 12 Hrs
Disjoint Sets, Divide And Conquer
Disjoint Sets: Disjoint Set Operations - Union and find Algorithms
Divide and Conquer: General Method - Applications-Binary Search – Quick Sort - Merge Sort- Strassen's Matrix Multiplication.

UNIT III 12 Hrs
Dynamic Programming
General Method –Applications-Matrix Chain Multiplication - Multistage Graphs - 0/1 Knapsack Problem - All Pairs Shortest Path Problem - Travelling Sales Person Problem – Reliability Design Problem.

UNIT IV 12 Hrs
Greedy Method and Backtracking
Greedy Method: General Method –Applications- Job Sequencing with Deadlines - Knapsack

Problem - Minimum Cost Spanning Trees - Single Source Shortest Path Problem - Backtracking:
General Method – Applications-N-Queens Problem - Sum of Subsets Problem - Graph Colouring - Hamiltonian Cycles.

UNIT V **12 Hrs**

Branch and Bound, Np-Hard And Np-Complete Problems

Branch And Bound: General Method - Applications - Travelling Sales Person 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.

Course Outcomes:

1. To gain knowledge of time complexity, space complexity and recurrence methods.
2. To design searching and sorting algorithms along with divide and conquer method and disjoint sets.
3. To apply Dynamic Programming design technique for problem solving.
4. To apply Greedy and back tracing design technique for problem solving
5. To understand the branch and bound algorithms for solving the complex problems

Text Books:

1. Ellis Horowitz, Satraj Sahni, Sanguthevar Rajasekharan, "Fundamentals of Computer Algorithms", Universities Press, 2nd Edition, 2015.
2. Alfred V. Aho, John E. Hopcroft, Jeffrey D, "The Design And Analysis Of Computer Algorithms", Pearson India, 1st Edition, 2013.

Reference Books:

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

BTCT2302 OBJECT ORIENTED PROGRAMMING THROUGH JAVA

L	T	P	C
3	0	0	3

Prerequisite: Programming for Problem Solving

Course Description:
The course introduces object-oriented programming (OOP) concept and OOP based software development methodology. In this course the students learn object-oriented nature of Java. Java is a class based and OOP language used to demonstrate and implement appropriate concepts and techniques.

Course Objectives:
1. Understand the basic concepts of Object-Oriented Programming principles.
2. Acquire knowledge of object-oriented paradigm in the Java programming language.
3. Develop programs related to the concepts of Inheritance, Data Abstraction.
4. Understand handling exceptions, streams and Collection Framework.
5. Apply Java and it's features in various applications in different platforms.

UNIT I **10 Hrs**
An Overview of Java: Evolution of java: Java's Lineage, creation of Java, How Java changed the Internet, Concept of JVM, Java's Magic: The byte code, Servlets, The Java Buzzwords, The Evolution of Java. An Overview of Java, Data types, Variables, and Arrays, Operators, Control statements.
Introducing classes:
Class Fundamentals, Enum, Declaring Objects, Introducing Methods, Constructors, This Keyword, Garbage Collection, The finalize() Method, A Stack Class. Overloading Methods and constructors, Using Object as Parameter, Argument Passing, Returning Objects, Recursion, Access control, static and final keywords, Introducing Nested and Inner classes, Using Command line Arguments, String Handling.

UNIT II **8 Hrs**
Inheritance, Packages and Interfaces:
Inheritance: Inheritance Basics, Using Super, creating a Multilevel Hierarchy, Method Overriding, Dynamic Method Dispatch, Using Abstract Class, Using final with Inheritance, The Object Class.
Packages and Interfaces: Packages- Access Protection, Importing Packages, Interfaces, Default Interface Methods, Static Methods in Interfaces.

UNIT III **9 Hrs**
Exception Handling and Multithreading:
Exception Handling: Exception handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch clauses, Nested try statements, throw, throws, finally, Java Built-in Exceptions, creating your own exception subclasses, Chained Exceptions, Three Recently added Exceptions features, Using Exceptions.

Multithreading: The Java thread model, Main thread, creating a Thread, Creating Multiple Thread, Thread priorities, synchronizing threads, Inter-thread communication, Suspending, Resuming and Stopping Threads, Obtaining A Thread's State.

UNIT IV **9 Hrs**

I/O and Collection Framework:

I/O: Basics, Reading Console Input, Writing Console Output, The Print Writer Class, Reading and Writing Files, Automatically Closing a File.

The Collections Framework: Collections overview, Collection Interfaces, The Collection classes- Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array Deque. Accessing a Collection via an Iterator, Spliterators, Storing User-Defined Classes in Collections, Working with Maps, Comparators, Arrays, The Legacy Classes and Interfaces.

UNIT V **9 Hrs**

Advanced Features of JDK8 and Data Base Connectivity: Introducing Lambda Expressions, Block Lambda Expression, Generic Functional Interfaces, Passing Lambda Expression and Exceptions, Passing, Stream Basics, Reduction Operations, Using Parallel Streams, Mapping, Collecting, Iterators and Streams, Exploring Streaming API.

Regular Expressions: Regular Expression Processing

Accessing Databases with JDBC- Introduction to JDBC Connectivity, Types of Drivers, basic steps in developing JDBC applications, Creating a new database and table with JDBC.

Course Outcomes:

1. Understand the basics of java programming like variables, operators, and control statements.
2. Design and implement object oriented (OO) programs to solve problems.
3. Analyse the importance of Inheritance and learn how to implement data abstraction.
4. Understand the concept of Exception Handling and streams.
5. Learn to implement the concept of Collection Framework, Lambda and Stream API.

Text Books:

1. "Java the Complete Reference", Herbert Schildt, MCGRAW HILL Education, 9th Edition,2016.
2. "Understanding Object – Oriented Programming with Java", T. Budd, updated edition, Pearson Education, 2000.

Reference Books:

1. "Programming with Java" T.V.Suresh Kumar, B.Eswara Reddy, P.Raghavan Pearson Edition.
2. "Object Oriented Programming through Java", P. Radha Krishna, 1st edition, Universities Press, 2007.
3. Core Java, Volume 1-Fundamentals, eighth edition, Cay S.Horstmann and Gary Cornell, Pearson education.
4. "An Introduction to programming and OO Design using Java", updated edition, Pearson Education, 2000.

BTCT2801 **DIGITAL LOGIC DESIGN** **L T P C**

3 0 0 3

Prerequisite: Basic Electronics

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 VHDL Programming for Digital Circuits.

Course objectives:

1. Provides introduction to logic designs and the basic building blocks used in digital systems.
2. To understand the number systems and codes, Boolean algebra, and logic gates.
3. To minimize the logical functions using Boolean algebra, K-maps, tabular method, and also to understand combinational circuits.
4. To understand different sequential circuits and different Arithmetic circuits.
5. To understand VHDL programming for digital circuits

UNIT I **8 Hrs**

Number Systems and Codes: Decimal, Binary, Octal, and Hexa-decimal number systems and their conversions, ASCII code, Excess-3 code, Gray code, Complement representation of negative numbers: Signed Magnitude, One's complement method, Two's complement method, Binary Arithmetic.

UNIT II **8 Hrs**

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, Code Conversion.

UNIT III **10 Hrs**

Combinational Logic Design: Analysis of combinational circuits, Design Procedure – Binary Adder, Subtractor, BCD Adder, multiplier, comparator, decoders, encoders, multiplexers, demultiplexers, Code Converters.

UNIT IV **10 Hrs**

Sequential Circuits: Latches: RS latch and JK latch, Flip-flops: RS, JK, D, T flip flops, Master-slave flip flops, Edge-triggered flip-flops. Shift registers, Universal Shift register, ripple counters, synchronous counters, Ring counter, Johnson counter, Up-Down counter.

UNIT V **9 Hrs**

VLSI Design flow: Design entry, Schematic, HDL, different modeling styles in VHDL, Data types and objects, Dataflow, Behavioral and Structural Modeling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits.

Course Outcomes:

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

1. Understand significance of number systems, conversions, binary codes.
2. Apply different simplification methods for minimizing Boolean functions.
3. Illustrate knowledge on design of various combinational circuits.
4. Illustrate the concept of sequential logic design, analyze the operation of flip-flops, registers, and counters.
5. Discuss the Use of HDL & appropriate EDA tools for digital logic design and simulation.

Text Books:

1. M. Morris Mano and Michael D. Ciletti, Digital Design, 4th Edition, Pearson Education, 2013.
2. D.V. Hall, “Digital Circuits and Systems”, Tata McGraw Hill, 1989

Reference Books:

1. Anand Kumar, Switching Theory and Logic Design, 2nd Edition, PHI, 2014.
2. Charles Roth, “Digital System Design using VHDL”, Tata McGraw Hill 2nd edition 2012.
3. R.P. Jain, “Modern digital Electronics”, Tata McGraw Hill, 4th edition, 2009.

TAUT2101 **HEALTH AND WELLNESS** **L T P C**
3 0 0 3

Course Description:

The course is designed to help students to learn more about human health. This course helps to understand how current health knowledge helps to make future human beings even stronger and healthier.

Course Objectives:

1. To help understand the importance of a healthy lifestyle
2. To familiarize students about physical and mental health
3. To create awareness of various life style 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 **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 **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 **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 **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 **9 Hrs**

Introduction to Functional Foods; Nutrients and Bioactive Compounds in Functional Foods; Functional Foods for Cardiovascular Health, Weight Management, Immune Function, Cognitive Health, Chronic Disease Prevention; Yoga and its importance in Health and Wellness

Course Outcomes:

Upon successful competition of the course the student would be able to -

1. Understand the relationship between fitness and wellness
2. Gain knowledge regarding various aspects and its practical implication for Wellbeing.
3. Learn about behavior change theories and strategies for promoting healthy habits such as exercise, stress management, and nutrition
4. Study techniques for setting realistic health goals, creating wellness plans, and overcoming barriers to maintaining a healthy lifestyle.
5. Learn about the principles of a balanced diet, regular physical activity, mental health management, social relationships, and environmental factors that influence health

Text Books:

1. Physical Activity and Health by Claude Bouchard, Steven N. Blair, William L. Haskell.
2. Mental Health Workbook by Emily Attached & Marzia Fernandez, 2021.
3. Mental Health Workbook for Women: Exercises to Transform Negative Thoughts and Improve WellBeing by Nashay Lorick, 2022.

Reference Books:

1. Lifestyle Diseases: Lifestyle Disease Management, by C. Nyambichu & Jeff Lumiri, 2018.
2. Physical Activity and Mental Health by Angela Clow & Sarah Edmunds, 2013.

BTCT2303 **CONSTITUTION OF INDIA** **L T P C**

3 0 0 0

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.

Course Outcomes:

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.
2. Exercise his fundamental rights in proper sense at the same time identifies his responsibilities in national building.
3. Analyze the Indian political system, the powers and functions of the Union, State and Local Governments in detail.
4. Understand Electoral Process, Emergency provisions and Amendment procedure.
5. Take part in competitive examinations with confidence.

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

BTCL2301:	JAVA PROGRAMMING LAB	L T P C
		0 0 2 1

Prerequisite: Programming for Problem Solving
Course Description:
The course introduces object-oriented programming (OOP) in the Lab. In this course the students learn object-oriented concepts through Java. This lab is devoted for students to work on practical experiments, projects and research work related to courses such as object-oriented programming and JAVA. This lab also enhances the programming skills through practical assignments and case-studies.

Course Objectives:
1. Learn to use object orientation to solve problems and use java language to implement them.
2. To experiment with the syntax and semantics of java language and gain experience with java programming.
3. Illustrate inheritance concepts for reusing the program.
4. Design and develop Java program using Lambda Expression.
5. Understand and use establish JDBC connection for Database Application

LIST OF EXPERIMENTS:
1. Preparing and practice – Installation of Java software, study of any Integrated developmentenvironment, sample programs on operator precedence and associativity, class and package concept, scope concept, control structures, constructors and destructors. Learn to compile, debug and execute java programs.
2. a) Write Java program(s) to display n prime numbers.
   b) Write Java program(s) to multiply two matrices.
3. a) Write a Java program to create a student class with following fields
   i. Hall ticket number
   ii. Student Name
   iii. Department Create ‘n’ number of Student objects where ‘n’ value is passed as input to constructor.
   b) Write a Java program to demonstrate String comparison using == and equals method.

4. Write a program in JAVA to demonstrate the method and constructor overloading.
5. a) Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords.
   b) Write a java program to implement the concept of dynamic method dispatch.
6. a) Write a java program to implement stack concept using interface.
   b) Write a java program to demonstrate the concept of Packages and Access protection in packages..
7. a) Write a java program to create a user defined exception that displays an error message when user enters an integer value greater than n.
   b) Write a Java program that creates three threads. First thread displays ―Good Morning‖ every one second, the second thread displays ―Hello‖ every two seconds and the third

thread displays ―Welcome‖ every three seconds.

8. a) Write a java program to list the number of characters, lines and words in a text file to another text file.
   b) Develop a java program to illustrate the concept of List using Java Collections.
   c) Develop a Java Program to illustrate the concept of Map using Java Collections
9. a) Develop a Java Program to implement comparator using lambda expressions.
   b) Develop a Java program using built-in functional interface (use one of the interface - Consumer, Supplier or Predicate).
   c) Develop a Java program to implement various operations using Stream API.
   d) Develop a Java program to implement simple pattern matching using regex package.
10. Develop a Java application to establish a JDBC connection, create a table student with properties name, register number, mark1, mark2, mark3. Insert the values into the table by using java and display the information of the students.

Course Outcomes:

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

1. Solve the problem using object-oriented approach and design solutions which are robust.
2. Develop portable programs which work in all environments using classes and objects.
3. Write the programs illustrating inheritance concept.
4. Create user defined exceptions and user friendly interfaces.
5. Apply Collection Framework, lambda expressions and Stream API for application development.

Text Books:

1. ”Java the Complete Reference”, Herbert Schildt, MCGRAW HILL Education, 9th Edition,2016.
2. “Understanding Object – Oriented Programming with Java”, T. Budd, updated edition, Pearson Education, 2000.

Reference Books:

1. “Programming with Java” T.V.Suresh Kumar, B.Eswara Reddy, P.Raghavan Pearson Edition.
2. “Object Oriented Programming through Java”, P. Radha Krishna, 1st edition, Universities Press, 2007.
3. Core Java, Volume 1-Fundamentals, eighth edition, Cay S.Horstmann and Gary Cornell, Pearson education.
4. “An Introduction to programming and OO Design using Java”, updated edition, Pearson Education, 2000.

BTCL2801 **DIGITAL LOGIC DESIGN LAB** **L T P C**
0 0 2 1

Prerequisite: Basic Electronics
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 language elements, synthesizable register transfer logic models in structural, dataflow, behavioral modeling of combinational and sequential circuits. This laboratory includes basic building block for the applications to VLSI chips.

Course Objectives:

1. Understand the pin configuration of various logic gates ICs
2. Realization of Demorgan'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 (Hardware)

1. Realization of Boolean Expressions using Gates
2. Design and realization of logic gates using universal gates
3. Design and realization of a 4 – bit Gray to Binary and Binary to Gray Converter
4. Verify the functionality of Mux and De-Mux ICs
5. Verify the functionality of Encoder and Decoder ICs
6. Design and realization of 4-bit comparator
7. Verify the functionality of D & T Flip-Flop ICs
8. Verify the functionality of S-R & J-K Flip-Flop ICs
9. Mod-N counter using 7490 and 74190.
10. Shift register IC 7495.

LIST OF EXPERIMENTS (Hardware)
VHDL Programming:

1. Write structural and dataflow VHDL models for
   a) Half adder / Half subtractor b) Full adder / Full subtractor
2. Write a VHDL program in structural model for
   a) 16:1 mux realization
   b) 3:8 decoder realization through 2:4 decoder
3. Write a VHDL program in behavioural model for
   a)3:8decoder
   b) 8:3 encoder
4. Write a VHDL program in structural and behavioural models for 8 bit asynchronous up-down counter
5. Write a VHDL program in structural model for 8-bit Universal Shift Register.

Course Outcomes:

At the end of this course students will have the ability to

1. Construct Basic combinational Circuits and Verification of its functionality
2. Construct Sequential Circuits and Verification of its functionality
3. Design, test and evaluate various combinational circuits such as adders, subtractors, multiplexers, demultiplexers, decoders etc.
4. Simulate various combinational circuits using VHDL
5. Simulate sequential circuits flip-flops, counters etc. using VHDL.

University Elective – III
(Semester -III)

TAUT2201 **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).

Course Outcomes:

By the end of the course, students should able to:

1. Understand and apply the concept related to community and social structure.
2. Develop the ability to involve and work with the social system.
3. Understand various social problems emerging in society and solve them.
4. Apply SBCC tools and SWOT analysis.
5. Appreciate Sustainable Development Goals and contribute beyond SDG 2030.

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).

TAUT2202 **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.

Course Outcomes:

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.
2. Apply knowledge of macro and micronutrients, dietary supplements, and hydration to design effective nutrition plans for individuals with diverse health needs and conditions.
3. Implement dietary interventions that contribute to the prevention, management, and improvement of chronic diseases, integrating nutritional strategies into comprehensive healthcare plans.
4. Evaluate and address ethical considerations in nutritional counseling, respecting cultural diversity and individual preferences while adhering to professional standards and evidence-based practices.
5. Critically analyze current research literature in clinical nutrition, utilizing evidence-based guidelines to make informed decisions and enhance patient outcomes in clinical settings.

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.

TAUT2203 EMOTIONAL INTELLIGENCE & MENTAL HEALTH **L T P C**
3 0 0 3

Course Description:

This course will explore the relationship between emotional intelligence and mental health. Students will learn about the importance of emotional intelligence in promoting positive mental health, and will develop skills in recognizing and regulating emotions, managing stress, and building resilience. The course will cover topics such as emotional intelligence theories, emotional regulation strategies, mindfulness, self-compassion, and the impact of emotions on mental health.

Course Objectives:

By the end of this course, students will be able to:

1. Understand the role of emotional intelligence in mental health
2. Develop skills in recognizing and regulating emotions
3. Understand the impact of stress on mental health and develop strategies for managing stress
4. Understand the importance of self-compassion in promoting positive mental health
5. Develop critical thinking and analytical skills in relation to emotional intelligence and mental health

UNIT I **9 Hrs**

Introduction to Emotional Intelligence and Mental Health; Definition and history of emotional intelligence, the role of emotional intelligence in mental health, Professional organizations and ethical codes related to emotional intelligence

UNIT II **9 Hrs**

Theoretical Perspectives on Emotional Intelligence; Ability model of emotional intelligence, Trait model of emotional intelligence, Mixed model of emotional intelligence, Mindfulness and Mental Health, Mindfulness and Mental Health.

UNIT III **9 Hrs**

Stress and Mental Health, Resilience and Mental Health; The impact of stress on mental health, Stress management techniques (e.g., relaxation techniques, time management, exercise) Definition and benefits of resilience, Factors that contribute to resilience, Building resilience in oneself and others.

UNIT IV **9 Hrs**

Self-Compassion and Mental Health, Emotions and Relationships; Definition and benefits of self-compassion, Practice of self-compassion, Relationship between self-compassion and mental health, Emotions and Relationships

UNIT V **9 Hrs**

Emotional Intelligence in the Workplace, Ethics and Emotional Intelligence; Emotional intelligence and job performance, the role of emotional intelligence in leadership, Emotional intelligence training in the workplace, Ethical issues related to emotional intelligence, Professional codes and standards related to emotional intelligence

Final Project Presentations

Students will present their final projects, which may include research papers, case studies, or other projects related to emotional intelligence and mental health.

Course Outcomes:

1. Able to provide an overview of emotional intelligence and mental health
2. Will understand the importance of emotional intelligence
3. The impact of stress on mental health, Stress management techniques
4. Relationship between emotional intelligence and mental health
5. Understand the importance of Emotional Intelligence in the workplace.

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. Covey, Stephen R., author. (2020). The 7 habits of highly effective people: powerful lessons in personal change. New York :Simon & Schuster.
2. Tolle, E. (2016). The power of now: A guide to spiritual enlightenment. Yellow Kite.

TAUT2204 **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.

Course Outcomes:

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
2. Understand the Human Rights of vulnerable groups
3. Know about the institutions enforcing the Human Rights
4. Understand the violations of Human Rights and the safeguards available to citizens.
5. Develop critical thinking and analytical skills by examining case studies and current events.

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.

TAUT2205 **INDUSTRY 4.0** **L T P C**
3 0 0 3

Course Description:

The Industry 4.0 aims to the "smart" and connected production systems that are designed to sense, predict, and interact with the physical world, so as to make decisions that support production in real-time. In manufacturing, it can increase productivity, energy efficiency, and sustainability.

Course Objectives:

The objective of this course is to make students:

1. To impart basic idea in Industry 4.0.
2. To provide students with good depth of knowledge of designing Industrial 4.0 Systems for various application.
3. To learn the artificial intelligence and machine learning techniques/ tools in health care.
4. To understand the bigdata technology and its applications in health care.
5. To learn the design and analysis of Industry 4.0 systems for healthcare applications.

UNIT I **9 Hrs**

Introduction: 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 **9 Hrs**

Cyber Physical System: Introduction to Cyber Physical Systems (CPS), Architecture of CPS-Components, Data science and technology for CPS, Emerging applications in CPS in different fields. Case study: Application of CPS in health care domain.

UNIT III **9 Hrs**

Artificial Intelligence & Machine Learning: Artificial Intelligence: Artificial Intelligence (AI) – What & 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-Applications areas of Machine Learning in Health care.

UNIT IV **9 Hrs**

Big Data & Cloud Computing: What is Big Data, Evolution of Big Data, sources of Big Data? Characteristics of Big Data Vs – Big Data Myths- Data Discovery-Traditional Approach, Big Data Technology: Big Data Technology Process– Applications of Bigdata in Healthcare.

Cloud Computing: Need– Definition – Types of Cloud-Types of Services– SaaS, PaaS, Iaas

UNIT V **9 Hrs**

Impact of Industry 4.0 on Healthcare Industry: An introduction Discover how Industry 4.0 is impacting and transforming the Healthcare Industry including self-diagnosis systems for patients, real-time diagnosis, 3D printed organs and Internet-of-Medical Things (IOMT).

Course Outcomes:

Upon completion of the course, student will be able to:

1. Understand the basic concepts of Industry 4.0 and the other related fields
2. Analyze, design and develop systems to solve the Engineering problems by integrating thermal, design and manufacturing Domains.
3. Understand the various artificial intelligence and machine learning tools in health care domain.
4. Apply bigdata technology in health care applications.
5. Apply the learned Engineering knowledge for the Development of society and self.

Text Books:

1. Jean-Claude André, ―Industry 4.0, Wiley- ISTE, July 2019, ISBN: 781786304827, 2019.
2. Diego Galar Pascual, Pasquale Daponte, Uday Kumar, ―Handbook of Industry 4.0 and SMART Systems, Taylor and Francis,2020

Reference Books:

1. P. Kaliraj, T. Devi, BigDataApplicationsinIndustry4.0, 2022, ISBN9781032008110, CRC Press, Taylor & Francis Group
2. P. Kaliraj, Devi Thirupathi, "Artificial Intelligence Theory, Models and Applications", Auerbach Publications, CRC Press, Taylor and Francis group, 2021.
3. Ethem Alpaydin, "Introduction to Machine Learning", Third Edition, MIT Press, 2014.
4. P. Kaliraj, T. Devi, Industry 4.0 and Education: Transformative Technology and Applications, 2022, CRC Press, Taylor & Francis Group.

TAUT2206 **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

Course Outcomes:

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.
2. Able to understand common diseases and disorders of the body systems
3. Able to identify diagnostic tools and techniques for the common diseases and disorders of the human body
4. Able to interpret medical records, lab reports, and other documentation to ensure clear and precise communication within healthcare teams and with patients
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.

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

TAUT2207 **SOCIAL NETWORK ANALYSIS** **L T P C**
3 0 0 3

Course Description:

A thorough introduction to Social Network Analysis (SNA), an interdisciplinary topic that studies the connections and interactions between people, groups, and things in various social contexts, is provided in this course. Students will receive a broad understanding of the core ideas, approaches and uses of SNA in a variety of disciplines. The course will cover data gathering methods, network visualization, fundamental network metrics, sophisticated network ideas and practical SNA implementations. Students will learn the skills necessary to evaluate social networks and gain useful insights from intricate network data through hands-on exercises.

Course Objectives:

1. To introduce students to the foundational concepts and historical background of Social Network Analysis (SNA).
2. To familiarize students with the basic building blocks of social networks, including nodes and edges and different types of social networks (e.g., online, offline, professional, friendship).
3. To provide students with an understanding of key network measures such as degree centrality, betweenness centrality, clustering coefficients and network density.
4. To demonstrate real-world applications of SNA, such as social network mining, influence and opinion dynamics, social network marketing and cybersecurity.
5. To equip students with practical skills for analyzing and interpreting social network data.

UNIT I **9 Hrs**

Overview of Social Network Analysis: Definition, history and key concepts. Nodes and Edges: Understanding the basic building blocks of social networks. Types of Social Networks: Exploring different types of social networks (e.g., online, offline, professional, friendship).Importance and Applications of SNA: How SNA is used in various fields (e.g., Engineering, Sociology, Psychology, Marketing and Business).

UNIT II **9 Hrs**

Data Collection Methods: Techniques for gathering social network data (e.g., surveys, interviews, online platforms). Data Representation: Different formats for representing network data (e.g., adjacency matrix, edge list).Network Visualization: Introduction to visualization tools for nd interpreting network structures.

UNIT III **9 Hrs**

Degree Centrality: Identifying influential nodes based on their connections. Betweenness Centrality: Understanding nodes that act as bridges in the network. Clustering Coefficients: Analyzing the degree of interconnectedness within local neighbourhoods. Network Density: Assessing the overall connectivity of a social network.

UNIT IV **9 Hrs**

Small World Phenomenon: Exploring the "six degrees of separation" concept. Homophily and Social Influence: Understanding how social networks shape individuals' behaviour and beliefs. Network Resilience and Robustness: Examining the impact of node removal on the network's stability. Network Motifs: Identifying recurring patterns in complex social networks.

UNIT V **9 Hrs**

Social Network Mining: Using SNA to extract meaningful patterns and insights from large-scale networks. Influence and Opinion Dynamics: Analyzing how information spreads through social networks. Social Network Marketing: Leveraging SNA for targeted marketing campaigns and product promotion. Online Social Networks and Cyber security: Understanding network-based threats and vulnerabilities.

Course Outcomes:

By the end of the course, students will be able to:

1. Comprehend the foundational concepts, methodologies and tools of Social Network Analysis.
2. Extract meaningful insights from social network data, identifying influential nodes and understanding network dynamics.
3. Apply SNA concepts to real-world challenges in areas such as marketing, cyber security and social dynamics.
4. Utilize SNA techniques to inform decision-making processes.
5. Conduct and interpret SNA in various domains effectively.

Text Books:

1. Social Network Analysis: Methods and Applications" by S. K. Garg, 2019, Wiley India.
2. Introduction to Social Network Analysis: Concepts, Methods and Applications" by R. K. Singh, 2020, Springer India.

Reference Books:

1. Social Network Analysis: Methods and Applications" by Stanley Wasserman, Katherine Faust (1994, Cambridge University Press)
2. Analyzing Social Networks" by Stephen P. Borgatti, Martin G. Everett, Jeffrey C. Johnson (2013, SAGE Publications)
3. Networks, Crowds and Markets: Reasoning About a Highly Connected World" by David Easley, Jon Kleinberg (2010, Cambridge University Press).

TAUT2208 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 9 Hrs

Antibiotics: Antibiotic Resistance, History of antibiotics, How resistance happens and spreads, Types of resistance- intrinsic, acquired, passive.

UNIT II 9 Hrs

Drug resistance - I: Trends in drug resistance, Actions to fight resistance, Bacterial persistence, Antibiotic sensitivity

UNIT III 9 Hrs

Drug resistance - II: Consequences of antibiotic resistance, Antimicrobial Stewardship – Barriers and opportunities, tools and models in hospitals.

UNIT IV 9 Hrs

Biomedical waste management and environmental safety - I: Definition of Biomedical, Waste, Waste minimization, BMW – Segregation, collection, transportation, treatment and disposal (including colour coding).

UNIT V 9 Hrs

Biomedical waste management and environmental safety - II: 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).

Course Outcomes:

At the end of this course, students should be able to:

1. Explain antibiotic resistance, its history, and mechanisms.
2. Analyse trends and strategies in drug resistance management.
3. Assess the consequences of antibiotic resistance and implement antimicrobial stewardship.
4. Understand principles and practices of biomedical waste management.
5. Apply modern technologies and PPE for effective biomedical waste handling and infection control.

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.

TAUT2209 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.

Course Outcomes:

End of the course completion student would be

1. Understand behavioral, social and cultural factors associated with health and illness.
2. Develop strategies to address barriers to practicing healthy behaviors and changing poor health habits across age groups.
3. Analyze the structure of society and various types of communication and identify the role of society, community, health education and communication in health.
4. Apply appropriate methods, models, tools and processes for understanding health behavior change, health education and promotion.
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.

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.

TAUT2201A **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

Course Ooutcomes:

By the end of the course, the students would be able to;

1. Understand various aspects and causes of disability.
2. Get insight on the efficacy of interventions and therapies to deal disability.
3. Assess the ethical and legal consideration of disability.
4. Acknowledge the importance of ADA act and it implementation in workplace.
5. Know and participate in various community-based disability programs.

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.

TAUT2201B **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 **9 Hrs**

Concepts of Disaster and Vulnerability

- 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 **9 Hrs**

Disasters Intervention Practices

- 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 **9 Hrs**

Disaster Management

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 **9 Hrs**

Applications of remote sensing & GIS in disaster management

- 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 **9 Hrs**

Practical exposure requirements: Field work/ community visit and Vulnerability Mapping, Safe community planning and implementation, Mock Drill/ Regional issues as per region/university

Course Outcomes:

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
2. Demonstrate, and practice disaster risk reduction activities towards sustainable development
3. Formulate, organize and assess disaster risk reduction
4. Plan activities according to the nature of disasters and factors of vulnerabilities
5. Able to mitigate disaster and educate communities

Mode of Evaluation: Continuous Assessment Test, Quizzes, Assignments, Multiple choice questions test, field work report, project report.

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.

TAUT2201C 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 9 Hrs
Introduction – Need, guidelines, content and process for Value Education Value Education
- 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 9 Hrs
Understanding harmony in the human being- Harmony in myself!
- 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 9 Hrs
Understanding harmony in the Family and Society- Harmony in Human relationship
- 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 9 Hrs
Understanding Harmony in Nature; Coexistence
- 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 **9 Hrs**

Implications of the above Holistic understanding of harmony on professional ethics

- 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

Course Outcomes:

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.
2. Students will demonstrate an understanding of the harmony within oneself, identifying the sentient self and the material body.
3. They will be capable of visualizing and explaining the concept of a universal harmonious order from the family level to the global level.
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.
5. They will be able to define and advocate for ethical human conduct in their professional lives.

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

TAUT2201D **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 **9 Hrs**

Evidence-based infection control principles and practices: Sterilization, Disinfection, Effective hand hygiene, Use of Personal Protective Equipment (PPE).

UNIT II **9 Hrs**

Infection control: Prevention & control of common healthcare-associated infections, Components of an effective infection control program, Guidelines (NABH and JCI) for Hospital Infection Control.

UNIT III **9 Hrs**

Antibiotics: Antibiotic Resistance, History of antibiotics, How resistance happens and spreads, Types of resistance- intrinsic, acquired, passive.

UNIT IV **9 Hrs**

Drug resistance: 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

Course Outcomes:

At the end of this course, students should be able to:

1. Apply effective infection control practices.
2. Prevent and manage healthcare-associated infections.
3. Explain the history and spread of antibiotic resistance.
4. Identify and combat drug resistance trends.
5. Implement antimicrobial stewardship strategies.

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 Book:

1. "Antimicrobial Stewardship: Principles and Practice" by Matthew Laundy, Lynda A. Sisson, and Matthew Dryden

TAUT2201E **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.

Course Outcomes:

After the completion of this course, the learners will be able to:

1. Explain the role and functions of NSS.
2. Appraise the role of NSS volunteers in developing the society as a whole.
3. Develop the necessary skills of effective communication, leadership and healthy living.
4. Develop the necessary skills to mitigate disasters and other environmental challenges.
5. Develop consciousness about personal health and hygiene.

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)

IV SEMESTER

BTCT2702 DETERMINISTIC STOCHASTIC AND STATISTICAL METHODS L T P C
3 1 0 4

Prerequisite: Basic Mathematics

Course Description:

This course provides a study of various Mathematical Methods and Statistical Methods which is needed for Artificial Intelligence, Machine Learning, and Data Science and also for Computer Science and engineering problems. This course will be rigorous, and will explore the rich and fascinating math behind some of the popular techniques and intellectual ideas of modern-day data science and machine learning.

Course Objectives:

1. To employ methods related to these concepts in a variety of data science applications.
2. To adopt a rigorous and mathematical approach to solving problems in machine learning and data science.
3. To apply the mathematical concepts discussed over the duration of the course.
4. To apply the concepts of probability and distributions to some case studies.
5. To Correlate results to the solution approach followed (Analysis).

UNIT I 12 Hrs

Data Representation:

Distance measures, Projections, Notion of hyper planes, half-planes. Principal Component Analysis- Population Principal Components, sample principal coefficients, covariance, matrix of data set, Dimensionality reduction, Singular value decomposition, Gram Schmidt process.

UNIT II 12 Hrs

Single Variable Distribution:

Random variables (discrete and continuous), probability density functions, properties, Mathematical Expectation - Probability distribution - Binomial, Poisson approximation to the binomial distribution and normal distribution their properties-Uniform distribution-exponential distribution.

UNIT III 12 Hrs

Stochastic Processes and Markov Chains:

Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, step transition probabilities, Markov chain, Steady state condition, Markov analysis.

UNIT IV 12 Hrs

Multivariate Distribution Theory:

Multivariate Normal distribution – Properties, Distributions of linear combinations, independence, marginal distributions, conditional distributions, Partial and Multiple correlation coefficient. Moment generating function. **BAYESIAN INFERENCE AND ITS**

APPLICATIONS: Statistical tests and Bayesian model comparison, Bit, Surprisal, Entropy, Source coding theorem, Joint entropy, Conditional entropy, Kullback-Leibler divergence.

UNIT V **12 Hrs**

Optimization:

Unconstrained optimization, Necessary and sufficiency conditions for optima, Gradient descent methods, Constrained optimization, KKT conditions, Introduction to non-gradient techniques, Introduction to least squares optimization, Optimization view of machine learning. Data Science Methods: Linear regression as an exemplar function approximation problem, linear classification problems.

Course Outcomes:

After completion of the course, students will be able to

1. Apply logical thinking to problem-solving in context.
2. Employ methods related to these concepts in a variety of data science applications.
3. Use appropriate technology to aid problem-solving and data analysis.
4. The Bayesian process of inference in probabilistic reasoning system.
5. Demonstrate skills in unconstrained optimization.

Text Books:

1. Mathematics for Machine Learning by A. Aldo Faisal, Cheng Soon Ong, and Marc Peter Deisenroth.
2. Dr. B.S Grewal, Higher Engineering Mathematics, 45th Edition, Khanna Publishers.
3. S. D. Sharma, Operations Research, Kedarnath and Ramnath Publishers, Meerut, Delhi.

Reference Books:

1. Operations Research, An Introduction, Hamdy A. Taha, Pearson publishers.
2. A Probabilistic Theory of Pattern Recognition by Luc Devroye, Laszlo Gyorfi, Gabor Lugosi.
3. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications.

BTCT2901 **MANAGEMENT FOR ENGINEERS** **L T P C**

3 0 0 3

Prerequisite: NIL

Course Description:

This course is intended to help the students to 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 shall have a broad view of different functional areas of management like operations, human resource, finance and marketing.

Course Objectives:

1. Introducing fundamental concepts of management that helps student understand intricacies of management world around us.
2. Introducing management aspects of nature starting from the basics and critical concepts of different nature,
3. Introducing productivity and its measurement; Competitiveness; Decision making process.
4. Introducing decision making and functional areas of management
5. Introducing various aspects related to entrepreneurship

UNIT I **9 Hrs**

Introduction to management Theory: Introduction to management theory, Management Defined, Characteristic of Management, Management as an art-profession, System approaches to Management, Task and Responsibilities of a professional Manager, Levels of Manager and Skill required.

UNIT II **9 Hrs**

Management and Organization: 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 **9 Hrs**

Productivity and decision making: 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 **9 Hrs**

Functional areas of management: Introduction to functional areas of management, Operations management, Human resources management, Marketing management, financial management.

UNIT V **9 Hrs**

Entrepreneurship: Introduction to entrepreneurship - Entrepreneurship in India, Role of

Government, Business plans, Corporate social responsibility, Patents and Intellectual property rights.

Course Outcomes:

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

1. Basic knowledge of management aspects
2. Understanding of organisations
3. Understanding of the productivity and decision-making concepts
4. Analyse the functional areas of management
5. Understanding entrepreneurship

Text Books:

1. H. Koontz, and H. Weihrich, Essentials of Management: An International Perspective. 8th ed., McGraw-Hill, 2009.
2. Robbins, S. P., Judge, T., Vohra, N. (2013). Organizational Behavior. India: Pearson.

Reference Books:

1. P. Kotler, K. L. Keller, A. Koshy, and M. Jha, Marketing Management: A South Asian
2. Perspective. 14th ed., Pearson, 2012.
3. M. Y. Khan, and P. K. Jain, Financial Management, Tata-McGraw Hill, 2008.
4. R. D. Hisrich, and M. P. Peters, Entrepreneurship: Strategy, Developing, and Managing a New Enterprise, 4th ed., McGraw-Hill Education, 1997.
5. J. Sumanth, Productivity Engineering and Management, McGraw-Hill Education, 1985.
6. K. Ashwathappa, 'Human Resources and Personnel Management', TMH, 3 rd. edition,
7. 2005.
8. R. B. Chase, Ravi Shankar and F. R. Jacobs, Operations and Supply Chain Management, 14th ed. McGraw Hill Education (India), 2015.
9. P C Tripathi and P N Reddy, Principles of management, TMH, 4th edition, 2008.

BTCT2501 **SOFTWARE ENGINEERING** **L T P C**

3 0 0 3

Course Description:

This course covers the fundamentals of software engineering, including understanding system requirements, finding appropriate engineering compromises, effective methods of design, coding, and testing, team software development, and the application of engineering tools. Successful software development depends on an in-depth understanding of how the phases and supporting activities of the software development life cycle work together. Each phase of the life cycle contributes to a reliable, maintainable product that satisfies user requirements. The application of good engineering practices throughout the cycle dramatically improves the likelihood of delivering a quality software project on time, in scope and within budget. The course will combine a strong technical focus with a capstone project providing the opportunity to practice engineering knowledge, skills, and practices in a realistic development setting with a real client.

Course Objectives:

The course should enable the students to:

1. Describe and compare various software development methods and understand the context in which each approach might be applicable.
2. Develop students' critical skills to distinguish sound development practices from ad hoc practices, judge which technique would be most appropriate for solving large- scale software problems, and articulate the benefits of applying sound practices.
3. Expand students' familiarity with mainstream languages used to model and analyse object designs (e.g., UML) and demonstrate the importance of formal and executable specifications of object models.
4. Explain the scope of the software maintenance problem and demonstrate the use of several tools for reverse engineering software.
5. Introduce state-of-the-art tools and techniques for large-scale software systems development.

UNIT I **9 Hrs**

Introduction to Software Engineering: Software characteristics, Software components, Software applications, Software Engineering Principles, Software metrics and measurement, monitoring and control. Software development life-cycle, Water fall model, prototyping model, Incremental model, Iterative enhancement Model, Spiral model.

UNIT II **9 Hrs**

Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document. **Requirements engineering process**: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

UNIT III **9 Hrs**

Design Engineering: Design process and design quality, design concepts, the design model. **Creating an architectural design**: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modelling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

UNIT IV **9 Hrs**

Validation and Verification: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging. **Metrics for Process and Products**: Software measurement, metrics for software quality.

UNIT V **9 Hrs**

Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM Plan. **Quality Management**: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

Applications:

Software Engineering in the Context of Health Care Industry: Challenges faced in current health care environments, Patient-centric approaches in software engineering, Types of software's used in Health Care Industry, Developing mobile apps and web apps for both patients and doctors, smart healthcare.

Course Outcomes:

After completion of the course, students will be able to

1. Apply the principles of the engineering processes in software development.
2. Demonstrate software project management activities such as planning, scheduling and Estimation.
3. Model the requirements for the software projects and prepare software requirement specifications
4. Select suitable Software Process model for software development.
5. Implement the software development processes activities from requirements to validation and verification.

Text Books:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.

Reference Books:

1. The unified modelling language user guide Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
3. Software Engineering principles and practice- Waman S Javadekar, The McGraw-Hill Companies.
4. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.

BTCT2304 DATABASE MANAGEMENT SYSTEMS L T P C
3 1 0 4

Prerequisite: NIL

Course Description:

Database Management Systems is intended to provide a clear understanding of fundamentals with emphasis on their applications to create and manage large data sets. It emphasizes on technical overview of database software to retrieve data from database. This includes database design principles, normalization, and concurrent transaction processing, security, recovery and file organization techniques. This will provide adequate knowledge to understand future evolutions of data technologies.

Course Objectives:

The objective of this course is to make students to:

1. Discuss the basic database concepts, applications, data models, schemas and instances and design Entity Relationship (E-R) model for a database.
2. Demonstrate the use of integrity constraints, relational algebra operations and relational calculus.
3. Describe the basics of SQL, construct queries using SQL, SQL functions, trigger and cursor concepts in PL/SQL.
4. Understand reasoning about functional dependency and to make the students to identify the role of normalization in database management systems.
5. To present the students with the knowledge of Transaction, concurrency and recovery strategies of DBMS

UNIT I 12 Hrs

Database Systems and Entity Relationship Modelling: Database System Applications - Purpose of Database Systems - View of Data - Database Languages - Database Users and Administrators - Various Components of overall Database System Structure- Data Models-The Entity-Relationship Model - Attributes and Entity Sets - Relationship Sets - Entity-Relationship Diagrams.

UNIT II 12 Hrs

Relational Data Model: Introduction to the Relational Model - Integrity Constraints - Relational algebra selection and projection - set operations- renaming – joins -division-examples of algebra queries- Tuple Relational Calculus - Domain Relational Calculus- Expressive power of algebra and calculus.

UNIT III 12 Hrs

Introduction to SQL: Structured Query Language (SQL): Introduction to SQL -Data types - Data Definition language commands - Data Manipulation language Commands and Data control Language Commands - Candidate Key - Primary key - Foreign key - Select Clause - Where Clause - Logical Connectivity’s – AND - OR - Range Search - Pattern Matching - Order By - Group By - Set Operations – Union - Intersect and Minus - Aggregate Functions - Join Operations. PL/SQL: Control Structures - functions - Triggers and Cursors.

UNIT IV **12 Hrs**

Normalization: Introduction to Schema Refinement - Properties of Decompositions – Functional Dependencies – Attribute closure - Normal Forms - First - Second - Third – BCNF - Basic definitions of MVDs and JDs - Fourth and Fifth normal forms.

UNIT V **12 Hrs**

Transaction Processing Concepts and Concurrency Control Techniques: Transaction Concept - Transaction States - Implementation of Atomicity and Durability - Serializability - Recoverability - Concurrent Executions - Lock-Based Protocols for Concurrency Control - Time Stamp-Based Protocol for Concurrency Control - Multiple Granularity Recovery System: Recovery and Atomicity – Log based Recovery – Recovery with Concurrent Transactions, Query Processing, Query Optimization, Storage Management.

Course Outcomes:

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

1. Demonstrate knowledge on Data models and Database Languages and Design Entity Relationship model for a database
2. Analyse the relational database theory, and be able to write relational algebra and relational calculus expressions for queries
3. Analyse and evaluate the databases using SQL DML/DDL Commands
4. Analyse databases using normal forms to provide solutions for real time applications
5. Understand the properties of transactions in a database system, Analyse concurrency control techniques for handling concurrent transactions and understand recovery of data from failures

Text Books:

1. Henry F. Korth, Silberchatz, Sudarshan, “Database System Concepts”, 7/e, 2019, Tata McGraw-Hill, New York.
2. Raghu Rama Krishnan, “Database Management System”, 2/e, 2000, Tata McGraw Hill, New York.

Reference Books:

1. Ramez Elmasri, Shamkant B. Navathe, "Fundamental Database Systems", Pearson Education, 6th Edition, 2014.
2. Database Principles Fundamentals of Design Implementation and Management, Carlos Coronel, Steven Morris, Peter Robb, Cengage Learning.
3. Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH
4. “Database Systems, Concepts, Design and Applications” by S.K.Singh, Pearson Education.

BTCT2305 **OPERATING SYSTEMS** **L T P C**

3 1 0 4

Prerequisite: NIL

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 with the important storage mechanisms in operating systems.
5. Apply various schemes for achieving system protection and security

Unit I **12 Hrs**

Introduction to OS: Functionality of OS - OS design issues - Structuring methods (monolithic, layered, modular, micro-kernel models) - Abstractions, processes.

OS Principles: System calls, System/Application Call Interface – Protection: User/Kernel modes - Interrupts

Unit II **12 Hrs**

Scheduling: Processes Scheduling - CPU Scheduling: Pre-emptive, non-pre-emptive – Multiprocessor scheduling – Deadlocks - Resource allocation and management - Deadlock handling mechanisms: prevention, avoidance, detection, recovery.

Concurrency: Inter-process communication, Synchronization - Implementing synchronization primitives (Peterson's solution, Bakery algorithm, synchronization hardware) - Semaphores – Classical synchronization problems, Monitors: Solution to Dining Philosophers problem

Unit III **12 Hrs**

Memory Management: 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 **12 Hrs**

Storage Management, Protection and Security: Disk structure and attachment – Disk scheduling algorithms (seek time, rotational latency based)-System threats and security – Policy vs mechanism - Access vs authentication

Unit V **12 Hrs**

System protection: Access matrix – Capability based systems - OS: performance, scaling, future directions in mobile OS, Recent Trends.

Course Outcomes:

After completion of the course, students will be able to

1. To interpret the evolution of OS functionality, structures and layers. System calls and to find the stages of various process states.
2. To design a model scheduling algorithm to compute various scheduling criteria.
3. To apply and Analyse communication between inter process and synchronization techniques. Implement page replacement algorithms, memory management problems and segmentation.
4. To differentiate the file systems for applying different allocation and access techniques.
5. Develop the security mechanism for system protection

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).

BTCT2307 COMPUTER ORGANISATION AND ARCHITECTURE

L	T	P	C
3	1	0	4

Course Description:

Computer Architecture is a core curriculum of computing and engineering programs, which aims to cultivate students' abilities towards the basic architecture of uniprocessor in terms of system performance. Studies of recent high-performance microprocessors, vector processors, and memory systems design to improve cache performance, multi-programming and I/O design improvements like: program I/O VS Interrupt driven I/O. The design optimization of PAL or PLA's. Finally on top of technology the implementation of FPGA and CPLD's

Course Objectives:

The objective of this course is to make students to:

1. To provide the understanding on basic structure and digital computer operations
2. To develop the skills on different communication methods with I/O devices and interfaces
3. To deliver the knowledge of the architecture and assembly language programming of 8085 microprocessor.
4. To understand the peripherals and their interfacing with 8085 microprocessors.
5. To analyse the concept of different levels of RAID and taxonomy of parallel machine models.

UNIT I **12 Hrs**

Introduction To Computer Systems - Overview of Organization and Architecture - Functional components of a computer -Registers and register files-Interconnection of components Organization of the von Neumann machine and Harvard architecture- Performance of processor. Data representation, fixed and floating point and error detecting codes.

UNIT II **12 Hrs**

Fundamentals of Computer Architecture: Introduction to ISA (Instruction Set Architecture)- Instruction formats- Instruction types and addressing modes- Instruction execution (Phases of instruction cycle)- Assembly language programming-Subroutine call and return mechanisms-Single cycle Data path design-Introduction to multi cycle data path-Multi cycle Instruction execution.

UNIT III **12 Hrs**

CPU Micro Programmed Control: Control memory, address sequencing, micro program example, and design of control unit. Computer Arithmetic: Fixed point representation of numbers algorithms for arithmetic operations: multiplication (Booths, Modified Booths) - division (restoring and non- restoring) - Floating point representation with IEEE standards and algorithms for common arithmetic operations- Representation of non-numeric data (character codes).

UNIT IV **12 Hrs**

The Memory System: Memory systems hierarchy-Main memory organization-Types of Main memory-memory inter- leaving and its characteristics and performance- Cache memories: address mapping-line size- replacement and policies- coherence- Virtual memory systems-TLBReliability of memory systems- error detecting and error correcting systems.

UNIT V **12 Hrs**

Device Subsystems: Externa lst- RAID Levels- I/O Performance. Performance Enhancements: Classification of models - Flynn's taxonomy of parallel machine models (SISD, SIMD, MISD, MIMD)- Introduction to Pipelining- Pipelined data path-Introduction to hazards. Contemporary issues: Recent Trends: Multiprocessor architecture: Overview of Shared Memory architecture, Distributed architecture.

Course Outcomes:

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

1. To recognize the functionalities of computer architecture and its components.
2. To apply various basic algorithms and operations to solve complex arithmetic problems complying with IEEE standards.
3. To apply the concepts of memory management for analysis of system performance.
4. To identify the I/O components of computer architecture and their performance.
5. To describe pipelining mechanisms and recognize different parallel machine models.

Text Books:

1. M. Morris Mano, Computer System Architecture, 3rdedition,PHI,India, 2006.
2. Carl Hamacher, ZvonksVranesic, SafeaZaky, Computer Organization, 5th edition, McGraw Hill, New Delhi,India,2010.

Reference Books:

1. William Stallings, Computer Organization and Architecture, designing for performance, 8 th edition, Prentice Hall, NewJersy, 2010.
2. Andrew S. Tanenbaum, Structured Computer Organization, 5th edition, Pearson Education Inc, NewJersy, 2006. 3. Sivarama P. Dandamudi, Fundamentals of Computer Organization and Design, Springer Int. Edition, USA, 2003
3. David A. Patterson and John L. Hennessy Computer Organization and Design-The Hardware/Software Interface 5th edition, Morgan Kaufmann, 2013
4. Tanenbaum, A.S ,2016. Structured computer organisation., Pearson Education, India

BTCT2306 **UNIVERSAL HUMAN VALUES** **L T P C**

3 0 0 0

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:

The objective of the course is fourfold:

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 developing clarity) the harmony in the human being, family, society and nature/existence strengthening of self-reflection.
4. Analyze the meaning of happiness and prosperity, and how to live in harmony with others.
5. Development of commitment and courage to act.

UNIT I **9 Hrs**

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

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 **9 Hrs**

Understanding Harmony in the Human Being - Harmony in Myself!

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 **9 Hrs**

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

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 the 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 **9 Hrs**

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

Understanding the harmony in the 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 **9 Hrs**

Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values - Definitiveness of Ethical Human Conduct- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order-Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for 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: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations - Sum up.

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. ISBN 978-93-87034-47-1.

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. ISBN 978-93-87034-53-2.

Reference Books:

1. JeevanVidya: EkParichaya, ANagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. A.N.Tripathi, “HumanValues”, NewAgeIntl.Publishers,NewDelhi,2004.
3. The Story of Stuff(Book).
4. **MohandasKaramchandGandhi “TheStoryofMyExperimentswithTruth”**
5. **E. FSchumacher. “Small is Beautiful”**
6. SlowisBeautiful–CecileAndrews
7. J C Kumarappa “Economy of Permanence”

8. PanditSunderlal“Bharat Mein Angreji Raj”
9. Dharampal, “Rediscovering India”
10. Mohandas K.Gandhi, “Hind Swaraj or Indian Home Rule”
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland(English)
13. Gandhi - Romain Rolland (English)

BTCL2302	DATABASE MANAGEMENT SYSTEMS LAB	L T P C
		0 0 2 1

Prerequisite: NIL

Course Description:

This Laboratory course introduces the query language for design and development of a database by using various software's such as SQL, ORACLE etc. It provides practice on built-in SQL functions using languages like DDL, DCL, DML and TCL to create and manage database systems and perform Set operations, Sub Queries, Joins; and PL/SQL programs to implement Exceptions, Cursors, Stored Functions, Views, Sequences, Locks and Triggers.

Course Objectives:

The objective of conducting this lab is to enable the students to:

1. Demonstrate practical knowledge on creation and alteration of tables, insertion and querying of data and Analyse and evaluate the databases using SQL DML/DDL commands.
2. Write SQL Queries to implement a Database Schema for the given Database.
3. Design 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. Programming PL/SQL including procedures, functions, cursors and triggers.

Experiments:

1. **Practice of DDL and DML Commands**
2. **Exercise on DDL and DML Commands**
    a. Create student table with the following structure name varchar2(10), rollno varchar2(5).
    b. Add branch column to the student table.
    c. Increase the size of rollno column from 5 to 10.
    d. Add marks1, marks2, marks3, dob columns to the student table.
    e. Insert at least 5 rows to the student table
    f. Display name and rollno of all the students.
    g. Add total column to the student table.
    h. calculate the total of every student.
    i. Display the details of 'cse' students.
    j. Display the structure of student table.
    k. Display all rows and columns from student table.
    l. Display the name and total obtained by every student.
    m. Display the details of students who got above 250 marks.
    n. Add average column to student table.
    o. Find out the average marks for every student.
    p. Display the details of students who got above 80%.
    q. Modify the branch values from 'CSE' to 'ECE'.
    r. Display the details of students whose dob is 12-05-1991.
    s. Remove details of ECE students.

t. Remove dob column from student table.
u. Remove all the records from student table.

3. **Practice of SQL Operators (Arithmetic, Logical, Relational, Between and, is null and like operator)**
4. **Exercise on SQL Operators**
   - **a.** Create employee table with the following structure empname varchar2(15), empno number(3), salary number(5), deptno number(3).
   - **b.** Insert at least 5 rows into employee table.
   - **c.** Display the details of employee table.
   - **d.** Eliminate duplicate rows from employee table if any.
   - **e.** Eliminate duplicate names in employee table.
   - **f.** Display the details of employee table in salary ascending order.
   - **g.** Display the details of employee table in empname alphabetic order.
   - **h.** Display the details of employee table in salary descending order.
   - **i.** Create table emp1 which is having same information as employee.
   - **j.** Create a table emp2 from emp1 without getting the records of emp1 table.
   - **k.** Display the details of employee table whose salary is <= 8000.
   - **l.** Increment the salaries of employee by 20%.
   - **m.** Display empname, empno who is working in deptno 10;
   - **n.** Display empname, empno who is not working in deptno 30.
   - **o.** Display the details of employee table whose salary in between 8000 and 20000.
   - **p.** Add a column commission number (4) to employee table.
   - **q.** Update the employee table such that, if salary is > 10000 then commission is 2000.
   - **r.** Update the employee table such that, if salary is between 5000 and 10000 then commission is 1000.
   - **s.** Display the details of employee whose name contain 3rd letter as ‘r’.
   - **t.** Display the details of employee whose name contains exactly 7 characters.
   - **u.** Display the details of employee whose commission is null.
   - **v.** Display the details of employee who is working in deptno 20 and 30.
   - **w.** Display the details of employee whose commission is not null.
   - **x.** Display the details of employee whose salary is 20000 or deptno is 20.
   - **y.** Display the details of employee whose salary is 25000 and deptno is 10.
   - **z.** Display the details of employee whose salary is not 25000.
   - **aa.** Create table emp3 which contains the details of employee table in ascending order of their salary.

4. **Practice of different Integrity Constraints like Not null, Check, Primary Key , Unique Key and Referential Integrity (Foreign Key) Constraints.**
5. **Exercise on Integrity Constraints**
   - a. Create emp table with the following structure empno number(6), empname varchar2(10), job char(10), deptno number(4), salary number(5), comm number(3). Job values are Sales executive, Analyst, Manager, Clerk. Allow null values for all columns except empno and deptno.

b. Add a column phoneno number(10) to emp table.
c. Modify the column width of Job field of emp table.
d. Create dept table with the following structure deptno number (4) primary key, deptname char (15), location char (15). deptname values (Sales, Marketing, Production).
e. Add constraints to emp table such that empno as primary key and deptno as foreign key.
f. Add constraints to emp table to check the value of empno greater than 100 while entering values.
g. Add constraints to emp table such that the default salary is 5000 otherwise the values entered by the user.
h. Add columns DOJ and DOB to emp table.
i. Insert at least 5 rows into dept table.
j. Insert at least 10 rows into emp table.
k. Update the emp table set the value of comm as 999.
l. Create a table emp1 with the same structure as emp and insert rows into the table using select class.
m. Delete those rows from emp that have deptno value as 10.
n. Display unique deptno values from emp table.
o. Display maximum and minimum salary of emp table and display the output under heading "Minimum Salary" and "Maximum Salary" respectively.
p. Find out the average salary of emp table.
q. Find out the 5^{th} maximum salary of emp table.
r. Find out the 3^{rd} lowest salary of emp table.
s. Display the first 3 highest salaries and last 3 lowest salaries from emp table.
t. Drop the comm column from emp table.
u. Create a view View1 (empno, deptno, salary) from emp and perform insert, delete and update operations.
v. Create a view View2 (empno, salary) from emp, (deptno, deptname) from dept and perform insert, delete and update operations.
w. Drop the view named View2.
x. Display all emp values from sales or production.
y. Display the details of employees who joined between 01-01-2020 and 1-06-2021.

6. **Exercise on Relational Algebra operations (Set operations, Different Types of Joins like Natural Join, Equi Join, Theta Join and outer join)**
7. **Practice of SQL Functions (Number, Character, Date, Conversion and Aggregate functions)**
8. **PL/SQL Programs**
   a. Write a PL/SQL program to swap two numbers.
   b. Write a PL/SQL program to find the largest of three numbers.
   c. Write a PL/SQL program to find the total and average of 6 subjects and display the grade.

d. Write a PL/SQL program to find the sum of digits in a given number.
e. Write a PL/SQL program to display the number in reverse order.
f. Write a PL / SQL program to check whether the given number is perfect number or not.
g. Write a PL/SQL program to find the factorial of a given number.
h. Write a PL/SQL code block to calculate the area of a circle for a value of radius varying from 3 to 7. Store the radius and the corresponding values of calculated area in an empty table named areas, consisting of two columns radius and area.

9. **Triggers and Cursors**

10. CASE STUDY 1: **GENERAL HOSPITAL**

A General Hospital consists of a number of specialized wards (such as Maternity, Pediatric, Oncology, etc). Each ward hosts a number of patients, who were admitted on the recommendation of their own GP and confirmed by a consultant employed by the Hospital. On admission, the personal details of every patient are recorded. A separate register is to be held to store the information of the tests undertaken and the results of a prescribed treatment. A number of tests may be conducted for each patient. Each patient is assigned to one leading consultant but may be examined by another doctor, if required. Doctors are specialists in some branch of medicine and may be leading consultants for a number of patients, not necessarily from the same ward.

For the above case study, do the following.

- Analyse the data required.
- Normalize the attributes.
- Create the logical data model using E-R diagrams.

CASE STUDY 2: **STUDENT PROGRESS MONITORING SYSTEM**

A database is to be designed for a university to monitor students' progress throughout their course of study. The students are reading for a degree (such as BA, BA (Hons) M.Sc., etc) within the framework of the modular system. The college provides a number of modules, each being characterized by its code, title, credit value, module leader, teaching staff and the department they come from. A module is coordinated by a module leader who shares teaching duties with one or more lecturers. A lecturer may teach (and be a module leader for) more than one module. Students are free to choose any module they wish but the following rules must be observed: Some modules require pre- requisites modules and some degree programmes have compulsory modules. The database is also to contain some information about students including their numbers, names, addresses, degrees they read for, and their past performance i.e. modules taken and examination results.

For the above case study, do the following:

- Analyse the data required.
- Normalize the attributes.
- Create the logical data model i.e., ER diagrams

Course Outcomes:

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

1. Design database for any real-world problem
2. Define SQL queries
3. Decide the constraints
4. Investigate for data inconsistency
5. Implement PL/SQL programs

Reference Books:

1. Ivan Bayross, "SQL, PL/SQL Programming", 2/e, 2011, BPB Publications, New Delhi, India.
2. Satish Ansari, "Oracle Database 11g: Hands-on SQL and PL/SQL", PHI Publishers, 2010.

BTCL2501 EXPLORATORY DATA ANALYTICS WITH R LAB

L	T	P	C
0	0	2	1

Prerequisite: Python Programming

Course Description:

This course covers the essential exploratory techniques for summarizing data. These techniques are typically applied before formal modelling commences and can help inform the development of more complex statistical models. Exploratory techniques are also important for eliminating or sharpening potential hypotheses about the world that can be addressed by the data. We will cover in detail the plotting systems in R as well as some of the basic principles of constructing data graphics. We will also cover some of the common multivariate statistical techniques used to visualize high-dimensional data.

Course Objectives:

The students will be able to learn:

1. How to manipulate data within R and to create simple graphs and charts used in introductory statistics.
2. Apply statistics in the real-life based problems.
3. The given data using different distribution functions in R.
4. The hypothesis testing and calculate confidence intervals; perform linear regression models for data analysis.
5. Summarize and interpret the decision regarding given data.

List of Experiments:

1. Introduction to R and Basic Commands
2. Computation of Tables and Graphs-Summary Statistics
3. Descriptive Statistics - measures of central tendency and dispersion
4. Random Variables and Probability Distributions
5. Discrete and Continuous Probability Distributions
6. Correlation and Regression
7. Multiple Linear Regression
8. Estimation
9. Testing of Hypothesis- I (Z test)
10. Testing of Hypothesis- II (t, F, Chi-square tests)

Course Outcomes:

After completion of the course, students will be able to

1. Utilize and R Data types for developing programs.
2. Understanding of statistical data and characterization of its all parameters.
3. Learn the important statistical random distribution functions and try to mimic or model the engineering, science, business and industry etc. related problems in terms of these functional distribution to find the meaningful solution.

4. Learn recent reliable and accurate statistical computational procedures for making inferences of a large variety of population parameters using known tabulated or software tools (R, Matlab etc.) computation.
5. Apply the understanding and the knowledge of statistical tools and properties to solve the real-life problems.

Text Books:

1. Norean R. Sharpe, Richard D. De Veaux, Paul F. Velleman, Business Statistics, Fourth Edition, Pearson Education. 2019.
2. Sandip Rakshit, “Statistics with R Programming”, McGraw Hill Education, 2018.

Reference Books:

1. S. C. Gupta and V. K. Kapoor, Fundamentals of Applied Statistics, S. Chand, 2006.
2. S. R. Mani Sekhar and T. V. Suresh Kumar, Programming with R, Ist Edition, CENGAGE, 2017.
3. R.E. Walpole, R.H. Mayers, S.L. Mayers and K. Ye, Probability and Statistics for engineers and scientists, 9th Edition, Pearson Education, 2018.
4. Miller & Freund’s, Probability and statistics for engineers, 8th edition, Pearson publication, 2018.
5. K G Srinivasa, G M Siddesh, ChetanShetty, Sowmya B J, “Statistical Programming in R”, Oxford Higher Education, 2017.

V SEMESTER

BTCT3501 **FULL STACK WEB DEVELOPMENT** **L T P C**

3 0 0 3

Prerequisite: Programming for Problem Solving

Course Description:

This course provides a comprehensive exploration of full-stack development, covering key components such as Node.js, MongoDB, Express, Angular, and React. Students will gain a solid understanding of web development frameworks and MVC architecture. The curriculum delves into practical aspects, including creating Node.js applications, building with MongoDB, implementing Express and Angular in web applications, and developing React applications.

Course Objectives:

1. Understand the basics of Web Development.
2. Acquire knowledge about front end tool JavaScript.
3. Apply front-end libraries AngularJS and ReactJS in web applications.
4. Acquire knowledge Node.js features and applications
5. Develop applications with MongoDB.

Unit I Introduction **9 Hrs**

Introduction to Web: Internet and World Wide Web, User, Browser, Web Server - HTML5 - CSS3 - Anatomy of a web page - Version Control System – Git and GitHub

Unit II Front End Development **9 Hrs**

JavaScript: The Basic of JavaScript: Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions – JQuery – JSX – Single Page Applications – MVC Architecture.

Unit III Front-End Framework **9 Hrs**

ReactJS: Introduction, Components, Props, Hooks, Redux, More Redux, React Forms.
AngularJS: Introduction, Expressions, Modules, ng-model directive, Data Binding, Controller, Scope, Form Validation.

Unit IV Back-End Framework **9 Hrs**

NodeJS: Basics of Node JS – Installation – Working with Node packages – Using Node package manager – Creating a simple Node.js application – Using Events – Listeners –Timers - Callbacks – Handling Data I/O – Implementing HTTP services in Node.js
ExpressJS: Introduction to Express Framework, Getting Started with Express, Configuring Routes - Using Request and Response objects, Your first Express App.

Unit V Database and Deployment **9 Hrs**

Understanding NoSQL and MongoDB – Building MongoDB Environment – User accounts – Access control – Administering databases – Managing collections – Connecting to MongoDB from Node.js – simple applications - Deploying Applications: Web hosting & Domains, Deployment Using Cloud Platforms.

Course Outcomes:

At the end of the course, students will be able to

1. Understand the basics of web development.
2. Understand the various Javascript libraries for web application development.
3. Analyze the features of Angular and Express.
4. Design and implementation of Node.js application.

5. Deploy web applications on cloud platforms

Text Books:

1. Web Design with HTML, CSS, JavaScript and JQuery Set Book by Jon Duckett, 2014
2. Professional JavaScript for Web Developers Book by Nicholas C. Zakas, 2012
3. Brad Dayley, Brendan Dayley, Caleb Dayley, 'Node.js, MongoDB and Angular Web Development', Addison-Wesley, Second Edition, 2018.
4. Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB. Copyright © 2015 BY AZAT MARDAN

Reference Books:

1. Chris Northwood, 'The Full Stack Developer: Your Essential Guide to the Everyday Skills
2. Expected of a Modern Full Stack Web Developer', Apress; 1st edition, 2018.
3. Kirupa Chinnathambi, 'Learning React: A Hands-On Guide to Building Web Applications
4. Using React and Redux', Addison-Wesley Professional, 2nd edition, 2018.
5. Full-Stack JavaScript Development by Eric Bush., Published by Red Sky, 2016
6. https://www.tutorialspoint.com/the_full_stack_web_development/index.asp
7. https://www.coursera.org/specializations/full-stack-react.
8. https://www.udemy.com/course/the-full-stack-web-development/

BTCT3301 **COMPUTER NETWORKS** **L T P C**

3 0 0 3

Prerequisite: NIL

Course Description:

Computer Networks is a fundamental course that provides an in-depth understanding of the principles, protocols, and technologies that underpin modern computer networks. This course is designed to equip students with the knowledge and skills required to design, implement, and manage computer networks, a critical component of today's information technology landscape.

Course Objectives:

1. Identify the components required to build various types of networks, understand the OSI and TCP/IP architectures.
2. Understanding MAC sublayer, Routing Protocols and IP addressing.
3. Learn the use of TCP, UDP protocols.
4. Develop skills to apply the concept of application layer protocols.
5. Understanding WLANs.

UNIT I Introduction, Physical and Data Link Layer **9 Hrs**

Fundamental Components of Networks – Network Topologies - OSI & TCP/IP References models – Transmission Media – Switching – Router - Data link layer design issues - Error detection and corrections – Stop and Wait protocol – Sliding window protocol – Go-back N protocol.

UNIT II MAC and Network Layer **9 Hrs**

MAC - Ethernet - Network layer design issues - Routing algorithms (RIP, OSPF, BGP, DSDV, DSR, AODV) – Congestion control algorithms – IPv4 and IPv6 address.

UNIT III Transport Layer **9 Hrs**

Elements of transport protocols – Congestion Control - The Internet Transport Protocols: UDP, TCP: Introduction – TCP Service model –TCP protocol – TCP segment header – TCP Connection Establishment, Connection release – TCP sliding window – TCP timer management – TCP Congestion control, STCP.

UNIT IV Application Layer **9 Hrs**

Domain Name System- Electronic mail (SMTP, POP3, IMAP, MIME) - WWW – HTTP – FTP - Web Services - Firewalls.

UNIT V WLANs **9 Hrs**

Introduction to Wireless Networks, Components of WLANs, WLAN Operation, Infrastructure Networks, Ad-hoc Networks, WLAN Threats, Secure WLANs, WLAN Configuration, Routing Concepts, IP Static Routing.

Course Outcomes:

1. Demonstrate knowledge on fundamentals of network components and topologies, Analyze the OSI and TCP/IP stack and the different protocols in Data Link layer.
2. Demonstrate various types of routing techniques and design the different routing protocols for wired / wireless.
3. Demonstrate uses of datagram delivery.
4. Apply the different strategies Operations of DNS, FTP, HTTP, Email Protocols, SNMP
5. Deploy secure wireless LANs, manage WLAN components, and understand WLAN operation, security, and deployment.

Text Books:

1. Andrew S. Tanenbaum, David J. Wetherall, "Computer Networks", Pearson Education, New Jersey, 5th edition, 2011.
2. Behrouz A. Forouzan, "Data Communications and Networking", Tata McGraw Hill, New Delhi, 5th edition, 2012.

Reference Books:

1. Computer Networking: Principles, Protocols and Practice, Olivier Bonaventure, CreateSpace Independent Publishing Platform, 1st Edition, 2014
2. Computer Networks: A Systems Approach, Larry L. Peterson and Bruce S. Davie, Morgan Kaufmann, 5th Edition, 2011.
3. Network Security Essentials: Applications and Standards, William Stallings, Pearson, 7th Edition, 2021.
4. Routing and Switching Essentials Companion Guide, Cisco Networking Academy, Cisco Press, 1st Edition, 2013

BTCT3502 DATA WAREHOUSING AND MINING

L	T	P	C
3	0	0	3

Course Description:

This course will introduce the concepts of data ware house and data mining, which gives a complete description about the principles, used, architectures, applications, design and implementation of data mining and data ware housing concepts.

Course Objectives:

The course should enable the students to:

1. Identify the scope and necessity of data mining & warehousing for the society.
2. Describe the designing of data warehousing so that it can be able to solve the root problems.
3. To understand various tools of data mining and their techniques to solve the real time problems. .
4. To develop ability to design various algorithms based on data mining tools.
5. To develop further interest in research and design of new data mining techniques.

UNIT I **9 Hrs**

Data Warehousing: Data Warehouse and OLAP Technology for Data Mining Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology, From Data Warehousing to Data Mining.

UNIT II **9 Hrs**

Data Mining: Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation- Architecture Of A Typical Data Mining Systems- Classification Of Data Mining Systems.

Association Rule Mining: Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

UNIT III **9 Hrs**

Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods, Prediction, Classifier Accuracy.

UNIT IV **9 Hrs**

Cluster Analysis: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Outlier Analysis.

UNIT V **9 Hrs**

Mining Complex Types of Data:

Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.

Course Outcomes:

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

1. Acquire a thorough knowledge in data warehousing architecture and implementation.
2. Apply data preprocessing techniques using modern tools.
3. Create association rule for mining the data in real time.
4. Design and deploy appropriate classification and cluster high dimensional data for better organization of data.
5. Evaluate various mining techniques on complex data objects.

Text Books:

1. Jiawei Han, Micheline Kamber and Jian Pei"Data Mining Concepts and Techniques", Third Edition, Elsevier, 2011.
2. Pang,Ning Tan, Michael Steinbach and Vipin Kumar "Introduction to Data Mining", Pearson Education, 2007.

Reference Books:

1. Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.
2. K.P. Soman, Shyam Diwakar and V. Ajay "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.

Faculty Elective-I

SOTT3401a OBJECT ORIENTED ANALYSIS AND DESIGN **L T P C**
3 0 0 3

Course Description:

Object-oriented analysis and design is a technical approach for analysing, designing a system by applying the object-orientated concepts, and develops a set of graphical system models during the development life cycle of the software. OOAD in modern software engineering is typically conducted in an iterative and incremental way. In this course, the students will learn how to produce detailed object models and designs from system requirements; use the modelling concepts provided by UML; identify use cases and expand into full behavioural designs; expand the analysis into a design ready for implementation and construct designs that are reliable.

Course Objectives:

1. Describe the activities in the different phases of the object-oriented development lifecycle.
2. Understand the concepts of object-oriented model with the E-R and EER models.
3. Model a real-world application by using UML diagram.
4. Design architectural modelling.
5. Describing an application of UML.

UNIT I **9 Hrs**

Introduction to UML: Importance of modelling, principles of modelling, object-oriented modelling, conceptual model of the UML, Architecture, Software Development Life Cycle.

UNIT II **9 Hrs**

Basic Structural Modelling: Classes, Relationships, common Mechanisms, and diagrams. Advanced Structural Modelling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages. Class & Object Diagrams: Terms, concepts, modelling techniques for Class & Object Diagrams.

UNIT III **9 Hrs**

Basic Behavioural Modelling-I: Interactions, Interaction diagrams.
Basic Behavioural Modelling-II: Use cases, Use case Diagrams, Activity Diagrams.

UNIT IV **9 Hrs**

Advanced Behavioural Modelling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams. Architectural Modelling: Component, Deployment, Component diagrams and Deployment diagrams.

UNIT V **9 Hrs**

Patterns and Frameworks, Artifact Diagrams. Case Study: The Unified Library application

Course Outcomes:

At the end of the course, student will be able to
1. The importance of modelling in UML.

2. Compare and contrast the object-oriented model with the E-R and EER models.
3. Design use case diagram.
4. Design an application using deployment diagram.
5. Apply UML diagrams to build library application.

Text Books:

1. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modelling Language User Guide, Pearson Education 2nd Edition.
2. Object-Oriented Analysis and Design with the Unified Process By John W. Satzinger, Robert B Jackson and Stephen D Burd, Cengage Learning.

Reference Books:

1. Meilir Page-Jones: Fundamentals of Object-Oriented Design in UML, Pearson Education.
2. Pascal Roques: Modelling Software Systems Using UML2, WILEY-Dreamtech India Pvt. Ltd.
3. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
4. Mark Priestley: Practical Object-Oriented Design with UML, TMH.
5. Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education
6. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY-Dreamtech India Pvt. Ltd.
7. UML and C++, R. C. Lee, and W. M. Tepfenhart, PHI.
8. Object Oriented Analysis, Design and Implementation, B. Dathan, S. Ramnath, Universities Press.
9. OO Design with UML and Java, K. Barclay, J. Savage, Elsevier.
10. Learning UML 2.0, Russ Miles and Kim Hamilton, O'Reill

SOTT3401b	**SOFTWARE ENGINEERING**	**L T P C**
		3 0 0 3

Course Description:

This course covers the fundamentals of software engineering, including understanding system requirements, finding appropriate engineering compromises, effective methods of design, coding, and testing, team software development, and the application of engineering tools. Successful software development depends on an in-depth understanding of how the phases and supporting activities of the software development life cycle work together. Each phase of the life cycle contributes to a reliable, maintainable product that satisfies user requirements. The application of good engineering practices throughout the cycle dramatically improves the likelihood of delivering a quality software project on time, in scope and within budget. The course will combine a strong technical focus with a capstone project providing the opportunity to practice engineering knowledge, skills, and practices in a realistic development setting with a real client.

Course Objectives:

The course should enable the students to:

1. Describe and compare various software development methods and understand the context in which each approach might be applicable.
2. Develop students' critical skills to distinguish sound development practices from adhoc practices, judge which technique would be most appropriate for solving large- scale software problems, and articulate the benefits of applying sound practices.
3. Expand students' familiarity with mainstream languages used to model and analyse object designs (e.g., UML).
4. Demonstrate the importance of formal and executable specifications of object models, and the ability to verify the correctness and completeness of the solution by executing the models.
5. Explain the scope of the software maintenance problem and demonstrate the use of several tools for reverse engineering software.

UNIT I **9 Hrs**

Introduction to Software Engineering: Software characteristics, Software components, Software applications, Software Engineering Principles, Software metrics and measurement, monitoring and control. Software development life-cycle, Water fall model, prototyping model, Incremental model, Iterative enhancement Model, Spiral model.

UNIT II **9 Hrs**

Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document. **Requirements engineering process**: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

UNIT III **9 Hrs**

Design Engineering: Design process and design quality, design concepts, the design model. **Creating an architectural design**: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modelling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

UNIT IV **9 Hrs**

Validation and Verification: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging. **Metrics for Process and Products**: Software measurement, metrics for software quality.

UNIT V **9 Hrs**

Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM Plan. **Quality Management**: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

Applications:

Software Engineering in the Context of Health Care Industry: Challenges faced in current health care environments, Patient-centric approaches in software engineering, Types of software's used in Health Care Industry, Developing mobile apps and web apps for both patients and doctors, smart healthcare.

Course Outcomes:

After completion of the course, students will be able to

1. Apply the principles of the engineering processes in software development.
2. Demonstrate software project management activities such as planning, scheduling and Estimation.
3. Model the requirements for the software projects.
4. Prepare software requirement specifications
5. Select suitable Software Process model for software development.

Text Books:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.

Reference Books:

1. The unified modelling language user guide Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
3. Software Engineering principles and practice- Waman S Javadekar, The McGraw-Hill Companies.

SOTT3401c **ARTIFICIAL INTELLIGENCE**

L	T	P	C
3	0	0	3

Prerequisite: Python Programming

Course Description:

Artificial Intelligence (AI) is a well-established, exciting branch of computer science concerned with methods to make computers, or machines in general, intelligent - so that they are able to learn from experience, to derive implicit knowledge from the one given explicitly, to understand natural languages such as English, Arabic, or Urdu, to determine the content of images, to work collaboratively together, etc. The techniques used in AI are as diverse as the problems tackled: they range from classical logic to statistical approaches to simulate brains. This pathway reflects the diversity of AI in that it freely combines a number of themes related to AI techniques, namely making sense of Complex Data, Learning from Data, Reasoning and Optimisation.

Course Objectives:

The primary objective of this course is to introduce the basic principles, techniques, and applications of Artificial Intelligence.

The course should enable the students to:

1. Artificial Intelligence (AI) is a fast-moving technology with impacts and implications for both individual lives and society as a whole.
2. To analyse various search strategies in intelligent systems.
3. Become familiar with basic principles of AI towards problem solving, Inference, Perception, Knowledge & Reasoning and Learning.
4. Investigate applications of AI techniques in intelligent systems, artificial neural networks,
5. Understanding the concepts of machine learning models and Robotics.

UNIT I **9 Hrs**

Overview of Artificial Intelligence: AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

UNIT II **9 Hrs**

Problem Solving and Search strategies: Searching**-** Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A*, AO* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

UNIT III **9 Hrs**

Knowledge and Reasoning: Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules-based deduction systems. Reasoning under uncertainty, review of probability, Bayes' probabilistic interferences and Dempster-Shafer theory.

UNIT IV **9 Hrs**

Logic & Knowledge Representation: First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, learning from observation, Explanation based learning, Statistical Learning methods, Reinforcement Learning.

UNIT V **9 Hrs**

Uncertain Knowledge and Reasoning, Learning, and Robotics: Uncertainty - Acting under uncertainty - Basic probability notation - The axioms of probability - Bayes' rule and its use - Learning from observations - Forms of learning - Inductive learning - Learning decision trees. **Robotics:** Introduction-Robot hardware - Robotic perception - Planning to move-Robotic software Architectures - Application Domains.

Course Outcomes:

After completion of the course, students will be able to

1. Solve basic AI based problems.
2. Define the concept of Artificial Intelligence.
3. Apply AI techniques to real-world problems to develop intelligent systems.
4. Select appropriately from a range of techniques when implementing intelligent systems.
5. Design and Implement robotics using AI techniques.

Text Books:

1. Artificial Intelligence a Modern Approach, 3/e, Stuart Russell and Peter Norvig, 2020, Pearson Education 4th edition, New Delhi, India.
2. Artificial Intelligence, 3/e, Elaine Rich, Kevin Knight and Shiva Shankar B Nair, 2004, Tata McGraw Hill, Hyderabad, India.

Reference Books:

1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education.
2. David Poole, Alan Mackworth, Randy Goebel," Computational Intelligence: a logical approach", Oxford University Press.
3. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education.
4. Rich, Knight, Nair: Artificial Intelligence, Tata McGraw Hill, Third Edition 2009.

SOTT3401d COMPUTER ORGANISATION AND ARCHITECTURE

L	T	P	C
3	0	0	3

Course Description:

Computer Architecture is a core curriculum of computing and engineering programs, which aims to cultivate students' abilities towards the basic architecture of uniprocessor in terms of system performance. Studies of recent high-performance microprocessors, vector processors, and memory systems design to improve cache performance, multi-programming and I/O design improvements like: program I/O VS Interrupt driven I/O. The design optimization of PAL or PLA's. Finally on top of technology the implementation of FPGA and CPLD's

Course Objectives:

The objective of this course is to make students to:

1. To provide the understanding on basic structure and digital computer operations
2. To develop the skills on different communication methods with I/O devices and interfaces
3. To deliver the knowledge of the architecture and assembly language programming of 8085 microprocessor.
4. To understand the peripherals and their interfacing with 8085 microprocessors.
5. To analyse the concept of different levels of RAID and taxonomy of parallel machine models.

UNIT I **12 Hrs**

Introduction To Computer Systems - Overview of Organization and Architecture - Functional components of a computer -Registers and register files-Interconnection of components Organization of the von Neumann machine and Harvard architecture- Performance of processor. Data representation, fixed and floating point and error detecting codes.

UNIT II **12 Hrs**

Fundamentals of Computer Architecture: Introduction to ISA (Instruction Set Architecture)- Instruction formats- Instruction types and addressing modes- Instruction execution (Phases of instruction cycle)- Assembly language programming-Subroutine call and return mechanisms- Single cycle Data path design-Introduction to multi cycle data path-Multi cycle Instruction execution.

UNIT III **12 Hrs**

CPU Micro Programmed Control: Control memory, address sequencing, micro program example, and design of control unit. Computer Arithmetic: Fixed point representation of numbers algorithms for arithmetic operations: multiplication (Booths, Modified Booths) - division (restoring and non- restoring) - Floating point representation with IEEE standards and algorithms for common arithmetic operations- Representation of non-numeric data (character codes).

UNIT IV **12 Hrs**

The Memory System: Memory systems hierarchy-Main memory organization-Types of Main memory-memory inter- leaving and its characteristics and performance- Cache memories: address mapping-line size- replacement and policies- coherence- Virtual memory systems-TLBReliability of memory systems- error detecting and error correcting systems.

UNIT V **12 Hrs**

Device Subsystems: Externa lst- RAID Levels- I/O Performance. Performance Enhancements: Classification of models - Flynn's taxonomy of parallel machine models (SISD, SIMD, MISD, MIMD)- Introduction to Pipelining- Pipelined data path-Introduction to hazards. Contemporary issues: Recent Trends: Multiprocessor architecture: Overview of Shared Memory architecture, Distributed architecture.

Course Outcomes:

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

1. To recognize the functionalities of computer architecture and its components.
2. To apply various basic algorithms and operations to solve complex arithmetic problems complying with IEEE standards.
3. To apply the concepts of memory management for analysis of system performance.
4. To identify the I/O components of computer architecture and their performance.
5. To describe pipelining mechanisms and recognize different parallel machine models.

Text Books:

1. M. Morris Mano, Computer System Architecture, 3rdedition,PHI,India, 2006.
2. Carl Hamacher, ZvonksVranesic, SafeaZaky, Computer Organization, 5th edition, McGraw Hill, New Delhi,India,2010.

Reference Books:

1. William Stallings, Computer Organization and Architecture, designing for performance, 8 th edition, Prentice Hall, NewJersy, 2010.
2. Andrew S. Tanenbaum, Structured Computer Organization, 5th edition, Pearson Education Inc, NewJersy, 2006. 3. Sivarama P. Dandamudi, Fundamentals of Computer Organization and Design, Springer Int. Edition, USA, 2003
3. David A. Patterson and John L. Hennessy Computer Organization and Design-The Hardware/Software Interface 5th edition, Morgan Kaufmann, 2013
4. Tanenbaum, A.S ,2016. Structured computer organisation., Pearson Education, India

SOTT3401e **LINUX PROGRAMMING** **L T P C**

3 0 0 3

PRE-REQUISITES: A course on Operating Systems

Course Description:

This course explains the fundamental ideas behind the open-source operating system approach to programming. Knowledge of Linux helps to understand OS level programming. Like the successful computer languages that came before, Linux is the blend of the best elements of its rich heritage combined with the innovative concepts required by its unique environment. This course involves kernel concepts, basics commands, shell scripting, file processing, Socket programming, Processes, Inter process communication. This course is presented to students by power point projections, course handouts, lecture notes, assignments, objective and subjective tests.

Course Objectives:

1. To teach principles of operating system including File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking Commands, Basic Linux commands, Scripts and filters.
2. To familiarize fundamentals of the Bourne again shell (bash), shell programming, pipes, input and output redirection Control structures, arithmetic in shell interrupt processing, functions, debugging shell scripts.
3. To impart fundamentals of file concepts kernel support for file, File structure related system calls (file API's).
4. To facilitate students in understanding Inter process communication.
5. To facilitate students in understanding semaphore and shared memory.

UNIT I **9 Hrs**

INTRODUCTION TO LINUX AND LINUX UTILITIES: A brief history of LINUX, architecture of LINUX, features of LINUX, introduction to vi editor. Linux commands-PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, Text Processing utilities and backup utilities, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk.

UNIT II **9 Hrs**

Introduction to Shells: Linux Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell/Environment Customization.

Filters: Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count Characters, Words or Lines, Comparing Files.

UNIT III **9 Hrs**

Grep: Operation, grep Family, Searching for File Content.

Sed: Scripts, Operation, Addresses, commands, Applications, grep and sed.

UNIX FILE STRUCTURE: Introduction to UNIX file system, Inode (Index Node), file descriptors, system calls and device drivers.

File Management: File Structures, System Calls for File Management – create, open, close, read, write, lseek, link, symlink, unlink, stat, fstat, lstat, chmod, chown, Directory API – opendir, readdir, closedir, mkdir, rmdir, umask.

UNIT IV **9 Hrs**

PROCESS AND SIGNALS: Process, process identifiers, process structure: process table, viewing processes, system processes, process scheduling, starting new processes: waiting for a process, zombie processes, orphan process, fork, vfork, exit, wait, waitpid, exec, signals functions, unreliable signals, interrupted system calls, kill, raise, alarm, pause, abort, system, sleep functions, signal sets. File locking: creating lock files, locking regions, use of read and write with locking, competing locks, other lock commands, deadlocks.

UNIT V **9 Hrs**

INTER PROCESS COMMUNICATION: Pipe, process pipes, the pipe call, parent and child processes, and named pipes: fifos, semaphores: semget, semop, semctl, message queues: msgget, msgsnd, msgrcv, msgctl, shared memory: shmget, shmat, shmdt, shmctl, ipc status commands.

INTRODUCTION TO SOCKETS: Socket, socket connections - socket attributes, socket addresses, socket, connect, bind, listen, accept, socket communications.

Course Outcomes:

After completion of the course, students will be able to

1. Ability to use various Linux commands that are used to manipulate system operations at admin level and a prerequisite to pursue job as a Network administrator.
2. Ability to write Shell Programming using Linux commands.
3. Ability to design and write application to manipulate internal kernel level Linux File System.
4. Ability to develop IPC-API's that can be used to control various processes for synchronization.
5. Ability to develop Network Programming that allows applications to make efficient use of resources available on different machines in a network.

Text Books:

1. W. Richard. Stevens (2005), Advanced Programming in the UNIX Environment, 3rd edition, Pearson Education, New Delhi, India.
2. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg. Thomson

Reference Books:

1. Linux System Programming, *Robert Love, O'Reilly*, SPD.
2. Advanced Programming in the UNIX environment, 2nd Edition, *W.R. Stevens*, Pearson Education.
3. UNIX Network Programming, *W.R. Stevens*, PHI.
4. UNIX for Programmers and Users, 3rd Edition, *Graham Glass, King Ables*, Pearson Education

SOTT3401f **ADVANCED DATA STRUCTURES** **L T P C**
3 0 0 3

Course Description:
In this course, students will learn about data structures, like graphs, that are fundamental for working with structured real-world data. You will develop, implement, and analyse algorithms for working with this data to solve real world problems.

Course Objectives:
The objective of this course is to make students to,
1. Gain knowledge and get familiarize with C++.
2. Be familiar with utilization of the concepts and techniques in problem solving.
3. Carry out asymptotic analysis of algorithm.
4. Analyze and can perform the operations related to dictionaries, sort.
5. Have a comprehensive knowledge of various non - linear data structures and algorithms.

UNIT I **9 Hrs**
The Origins of C++, What is Object Oriented Programming, some C++ fundamentals, C++ Class Overview-Class Definition, Objects, Class Members Access Control, Constructors and Destructors, Inline functions, this pointer, friend functions, Exception handling.

UNIT II **9 Hrs**
Function Overloading, Operator Over loading, Generic Programming–Function and Class Templates, Inheritance basics, base and derived classes, inheritance types, base class access control, runtime polymorphism using virtual functions, abstract classes.

UNIT III **9 Hrs**
Algorithms, performance analysis - Asymptotic notations - time complexity and space complexity. Review of basic data structures - List ADT– Linked Representation – Singly Linked List – Doubly linked List – Applications of lists-Stack ADT – Queue ADT – Implementation using template classes in C++.

UNIT IV **9 Hrs**
Dictionaries-Operations and Implementations-Hashing – General Idea – Hash Function – Separate Chaining – Open Addressing – Linear Probing, quadratic probing- Priority Queues (Heaps) – Simple implementations – Binary Heap – Heap Sort.

UNIT V **9 Hrs**
Search trees: Binary tree traversals-Binary search trees, Definition ADT, Implementation-AVL Trees, Implementation- Definition, Red-Black Trees and Splay Trees, B-Trees, Implementations, Comparison of Search Trees.
Graphs: Basic concepts, Graph Representation, Graph traversal (DFS & BFS).

Course Outcomes:

At the end of the subject, students will be able to:

1. Understand the concepts and properties of C++.
2. Apply the concepts and techniques of problem solving.
3. Compare and analyze basic techniques of algorithm analysis.
4. Understand advanced abstract data type (ADT) and data structures and their Implementations.
5. Choose appropriate non-linear data structure applied to specified problem definition.

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.

SOTT3401g **DATA WAREHOUSING AND MINING** **L T P C**

3 0 0 3

Course Description:

This course will introduce the concepts of data ware house and data mining, which gives a complete description about the principles, used, architectures, applications, design and implementation of data mining and data ware housing concepts.

Course Objectives:

The course should enable the students to:

1. Identify the scope and necessity of data mining & warehousing for the society.
2. Describe the designing of data warehousing so that it can be able to solve the root problems.
3. To understand various tools of data mining and their techniques to solve the real time problems. .
4. To develop ability to design various algorithms based on data mining tools.
5. To develop further interest in research and design of new data mining techniques.

UNIT I **9 Hrs**

Data Warehousing: Data Warehouse and OLAP Technology for Data Mining Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology, From Data Warehousing to Data Mining.

UNIT II **9 Hrs**

Data Mining: Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation- Architecture Of A Typical Data Mining Systems- Classification Of Data Mining Systems.

Association Rule Mining: Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

UNIT III **9 Hrs**

Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods, Prediction, Classifier Accuracy.

UNIT IV **9 Hrs**

Cluster Analysis: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Outlier Analysis.

UNIT V **9 Hrs**

Mining Complex Types of Data:

Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.

Course Outcomes:

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

1. Acquire a thorough knowledge in data warehousing architecture and implementation.
2. Apply data preprocessing techniques using modern tools.
3. Create association rule for mining the data in real time.
4. Design and deploy appropriate classification and cluster high dimensional data for better organization of data.
5. Evaluate various mining techniques on complex data objects.

Text Books:

1. Jiawei Han, Micheline Kamber and Jian Pei“Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2011.
2. Pang,Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007.

Reference Books:

1. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007.
2. K.P. Soman, Shyam Diwakar and V. Ajay “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.

SOTT3401h **MACHINE LEARNING** **L T P C**
3 0 0 3

Prerequisite: Python Programming

Course Description:

Machine Learning Fundamentals is an introductory course that provides students with a comprehensive understanding of the fundamental concepts, techniques, and applications of machine learning. This course aims to equip students with the knowledge and practical skills necessary to design, implement, and evaluate machine learning models for various real-world tasks.

Course Objectives:

1. To introduce students to the core concepts of machine learning, including supervised, unsupervised, and reinforcement learning.
2. To provide a thorough understanding of key machine learning algorithms and their underlying mathematical foundations.
3. To familiarize students with the process of acquiring, preprocessing, and transforming data for machine learning tasks.
4. To enable students to evaluate and compare the performance of different machine learning models using appropriate metrics.
5. To encourage critical thinking by exploring the ethical considerations and limitations of machine learning.

UNIT I **9 Hrs**

Introduction to Machine Learning Concepts: Introduction to Machine Learning, Types of Machine Learning, Supervise Learning, Unsupervised Learning, Reinforcement Learning, Linear Algebra basics, Review of Probability Theory, Bias-Variance Trade-off, Noise, Filter, Learning Multiple classes, Model Selection & Generalization.

UNIT II **9 Hrs**

Supervised Learning: Linear Regression: Linear Basis Function Models, Simple Linear Regression, Multiple Linear Regression, Bayesian Linear Regression. Classification: Logistic Regression, k-Nearest Neighbors, Decision Trees, Random Forest model, Support Vector Machines, Bayesian Networks.

UNIT III **9 Hrs**

Unsupervised Learning: Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA), Clustering: Introduction to clustering, K-means clustering, K-Mode Clustering, Hierarchal clustering, Anomaly Detection, Association: Apriori Algorithm, F-P Growth Algorithm, Eclat Algorithm, Ensemble method: Bootstrap Aggregation, Boosting, Gradient Boosting Machines, Stacking.

UNIT IV **9 Hrs**

Metrics, Model Evaluation and Reinforcement Learning

Evaluation Metrics: Bias-Variance Trade-off, Overfitting and Underfitting, Classification Metrics: Precision, Recall, F1-score, ROC Curve, AUC, Confusion Matrix, Regression Metrics: Mean Absolute Error (MAE), Mean Squared Error (MSE), R-squared, Cross-

Validation Techniques: K-Fold Cross-Validation, Stratified Cross-Validation, Leave-One-Out Cross-Validation (LOOCV).

UNIT V **9 Hrs**

Advanced Learning Model: Introduction to Reinforcement Learning, Applications of Reinforcement Learning, Q Learning, Policy Learning, Case Studies: Recommender System, Sentiment Analysis, Disease Detection.

Course Outcomes:

1. Understanding of machine learning, different types of machine learning and the basic mathematical concepts.
2. Demonstrate the different algorithms of supervised learning
3. Demonstrate the different algorithms of supervised learning, apply a tool to implement typical clustering algorithms for different types of applications.
4. Analysis the evaluation parameters involved in machine learning.
5. Design and implement various applications using machine learning algorithms.

Text Books:

1. Introduction to Machine Learning, Ethem Alpaydin, Third Edition, Prentice Hall of India, 2015.
2. Machine Learning, Tom Mitchell. First Edition, McGraw- Hill, 2017.

Reference Books:

1. Machine Learning, Dr Ruchi Doshi Dr Kamal Kant Hiran, BPB Publications, 2021.
2. Machine Learning using Python, Manaranjan Pradhan, U Dinesh Kumar, Wiley Publications, 2019.
3. Machine Learning: A Probabilistic Perspective, Kevin P. Murphy, MIT Press, 2012.
4. Machine Learning – An Algorithmic Perspective, Stephen Marsland, Second Edition, CRC Press, 2014.
5. Mathematics for Machine Learning, Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Cambridge University Press, 2020.

SOTT3401i DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS L T P C
3 0 0 3

Course Description:

This course introduces the concepts and applications of differentiation and integration of vector valued functions, differential equations. The objective of this course is to familiarize the prospective engineers with some advanced concepts and methods in Mathematics which include the Calculus of vector valued functions, ordinary differential equations which are invaluable for any engineer's mathematical tool box. The topics treated in this course have applications in computer science engineering.

Course Objectives:

The course should enable the students to:

1. Enlighten the learners in the concept of differential equations.
2. Furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.
3. Formulate and solve the higher order differential equation by analyzing physical situations.
4. Find the work done in moving a particle along the path over a force field.
5. Enlighten the learners in the concept of vector calculus.

UNIT I 9 Hrs

Linear Differential equations of first order: Introduction, Formation of a differential equation, Solutions (Variable separable, Homogeneous and non- Homogeneous), Linear and Bernoulli differential equations, Applications (Newton's law of cooling and decay and growth rate).

UNIT II 9 Hrs

Linear Differential equations of higher order: Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral, method of variation of parameters.

UNIT-III 9 Hrs

Equations reducible to Linear Differential Equations: Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients, Applications to L-C-R Circuit problems and Mass spring system.

UNIT IV 9 Hrs

Vector differentiation: Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

UNIT V 9 Hrs

Vector integration: Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and applications of these theorems.

Course Outcomes:

After completion of the course, students will be able to

1. Analyse the solutions of the first order linear differential equations and its applications.
2. Solve the higher order differential equation by analyzing physical situations.
3. Identify the essential characteristics of linear differential equations with constant coefficient.
4. Interpret the physical meaning of different operators such as gradient, curl and divergence.
5. Estimate the work done against a field, circulation and flux using vector calculus.

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, "Higher engineering mathematics", Khanna publishers, New edition.

Reference Books:

1. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
2. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018.
3. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.

SOTT3401j	NUMERICAL METHODS FOR ENGINEERS	L T P C
		3 0 0 3

Course Description:

This course emphasizes the implementation of numerical methods for computer aided solutions to problems that arise in engineering design and analysis. Methods include interpolation, extrapolation, curve fitting, and integration and techniques solving non-linear equations, systems of linear equations, and differential equations.

Course Objectives:

The course should enable the students to:

1. Be able to numerically solve systems of linear algebraic eqns.
2. Enlighten the learners in the concept of Interpolation.
3. Furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.
4. Apply appropriate numerical methods to solve the problem with most accuracy.
5. Assess the approximation techniques to formulate and apply appropriate strategy to solve real world problems.

UNIT I **9 Hrs**

Solution of Algebraic and Transcendental Equations: Bisection method, Regula - Falsi method, Iterative Method, Newton- Raphson method, Gauss Seidel method.

UNIT II **9 Hrs**

Curve Fitting: Principle of Least Squares-Fitting of curves-Fitting of linear, quadratic and exponential curves.

UNIT III **9 Hrs**

Interpolation: Finite differences, symbolic relations, Newton's forward and backward formulae, Gauss central difference formulae, Lagrange's difference formula.

UNIT IV **9 Hrs**

Numerical Differentiation & Integration: Derivatives using forward & backward difference formulae, Trapezoidal rule and Simpson's 1/3rd and 3/8th rules.

UNIT V **9 Hrs**

Solutions of Ordinary differential equations: Taylor's series method, Picard's method, Euler's and modified Euler's methods and Runge-Kutta method of fourth order.

Course Outcomes:

After completion of the course, students will be able to

1. Implement numerical methods for a variety of multidisciplinary applications and a variety of numerical algorithms using appropriate technology.
2. Acquire basic knowledge in solving interpolation with equal interval problems by various numerical methods.

3. Derive Least – Squares curve fitting procedures, fitting a straight line, fitting a parabola, nonlinear curve fitting, Curve fitting by a sum of exponentials.
4. Solve the real time problems by using numerical differentiation and integration.
5. Find the solution of ordinary differential equation of first order by Euler, Taylor, Picard's and Runge-Kutta methods.

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, "Higher engineering mathematics", Khanna publishers, New edition.

Reference Books:

1. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
2. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018.
3. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.

SOTT3401k MATHEMATICAL FOUNDATIONS OF CYBER SECURITY **L T P C**
3 0 0 3

Course Description:

This course introduces different mathematical concepts in cyber security. The cryptographic algorithms designed by some mathematical algorithms, to use the different keys. Number theory is well versed area in the cyber security. This course studies with strong math background to improve Strong analytics skills that needed.

Course Objectives:

The students will try to learn:

1. The concepts of number theory and its applications to information security.
2. The concept of congruences and its basic properties.
3. The security model and analyse them before being used in many commercial, industrial as well as web application.
4. The knowledge of encryption and decryption techniques and their applications in managing the security of data.
5. The general understanding of cyber security relationship with numbers.

UNIT I **9 Hrs**

Integers, Greatest common divisors and prime Factorization: The well-ordering property-Divisibility-Representation of integers-Computer operations with integers-Prime numbers-Greatest common divisors-The Euclidean algorithm -The fundamental theorem of arithmetic-Factorization of integers and the Fermat numbers-Linear Diophantine equations

UNIT II **9 Hrs**

Congruences: Introduction to congruences -Linear congruences-The Chinese remainder theorem-Systems of linear congruences

UNIT III **9 Hrs**

Applications of Congruences: Divisibility tests-The perpetual calendar-Round-robin tournaments-Computer file storage and hashing functions. Wilson's theorem and Fermat's little theorem- Pseudo primes- Euler's theorem- Euler's p hi-function- The sum and number of divisors- Perfect numbers and Mersenne primes.

UNIT IV **9 Hrs**

Finite fields & Primality, factoring: Finite fields- quadratic residues and reciprocity-Pseudo primes-rho method-Fermat factorization and factor bases.

UNIT V **9 Hrs**

Cryptology: Basic terminology - Character Ciphers - Block Ciphers-Exponentiation ciphers - Public-key cryptography - Discrete Logarithm-Knapsack ciphers - RSA algorithm-Some applications to computer science.

Course Outcomes:

After completion of the course, students will be able to

1. Understand number theory and its properties.
2. Understand principles on congruences.
3. Develop the knowledge to apply various applications.
4. Utilize finite fields, rho method and Fermat factorization.
5. Develop various encryption methods and its applications.

Text Books:

1. Kenneth H Rosen “Elementary number theory and its applications”, AT & T Information systems & Bell laboratories.
2. Neal Koblitz “A course in Number theory & Cryptography”, Springer.
3. Niven, H.S. Zuckerman and H. L. Montgomery, “An Introduction to the Theory of Numbers”, John Wiley and Sons.

Reference Books:

1. Herbert S. Zuckerman, “An Introduction to The Theory of Numbers”, Hugh L. Montgomery, Ivan Niven, Wiley publishers
2. Tom M Apostol “Introduction to Analytic number theory”, Springer
3. V K Krishnan “Elementary number theory”, Universities press
4. Leigh Metcalf, William Casey, “Cybersecurity and Applied Mathematics”, Syngress Publisher(s).

SOTT3401l INFORMATION RETRIEVAL SYSTEMS L T P C
3 0 0 3

Course Description:
This course is to present the scientific support in the field of information search and retrieval. This course explores the fundamental relationship between information retrieval, hypermedia architectures, and semantic models, thus deploying and testing several important retrieval models such as vector space, Boolean and query expansion. It discusses implementation and evaluation issues of new algorithms like clustering, pattern searching, and stemming with advanced data/file structures, indirectly facilitating a platform to implement comprehensive catalogue of information search tools while designing an e-commerce web site.

Course Objectives:
The objective of this course is to make students to,
1. Demonstrate genesis and diversity of information retrieval situations for text and hyper media.
2. Analyze the performance of information retrieval using advanced techniques such as, clustering, and regression analysis.
3. Describe hands-on experience store, and retrieve information from www using semantic approaches.
4. Analyze ranked retrieval of a very large number of documents with hyperlinks between them.
5. Demonstrate Information visualization technologies like Cognition and perception in the Internet or Web search engine.

UNIT I 9 Hrs
Introduction: Retrieval strategies: vector space model, Probabilistic retrieval strategies: Simple term weights, Non binary independence model, Language models.

UNIT II 9 Hrs
Retrieval Utilities: Relevance feedback, clustering, N-grams, Regression analysis, Thesauri.

UNIT III 9 Hrs
Retrieval utilities: Semantic networks, parsing Cross –Language: Information Retrieval: Introduction, Crossing the Language barrier.

UNIT IV 9 Hrs
Efficiency: Inverted Index, Query processing, Signature files, Duplicate document detection.

UNIT V 9 Hrs
Integrating structured data and text. A historical progression, Information retrieval as relational application, Semi Structured search using a relational schema. Distributed Information Retrieval: A theoretical Model of Distributed retrieval, web search

Course Outcomes:

At the end of this course, the student should be able to,

1. Describe models like vector-space, probabilistic and language models to identify the similarity of query and document.
2. Understand relevance feedback, implement clustering algorithms like hierarchical agglomerative clustering and k-means algorithm, illustrate how N-grams are used for detection and correction of spelling errors.
3. Understand natural language systems to build semantic networks for text, illustrate algorithms used for natural language processing.
4. Understand the measures to evaluate the performance of cross language information, query, document and phrase translation.
5. Design the method to build inverted index.

Text Books:

1. David A. Grossman, Ophir Frieder, Information Retrieval – Algorithms and Heuristics, Springer, 2nd Edition (Distributed by Universal Press), 2004.
2. Gerald J Kowalski, Mark T Maybury Information Storage and Retrieval Systems: Theory and Implementation, Springer, 2004.

Reference Books:

1. Soumen Chakrabarti, Mining the Web: Discovering Knowledge from Hypertext Data, Morgan – Kaufmann Publishers, 2002.
2. Christopher D Manning, Prabhakar Raghavan, Hinrich Schutze, An Introduction to Information Retrieval by Cambridge University Press, England, 2009.
3. Marcia J Bates, Understanding Information Retrieval Systems, CRC Press, 2012

SOTT3401m CRYPTOGRAPHY AND NETWORK SECURITY L T P C
3 0 0 3

Course Description:

The aim of this course is to introduce the student to the areas of cryptography and cryptanalysis. This course develops a basic understanding of the algorithms used to protect users online and to understand some of the design choices behind these algorithms. The course emphasizes to give a basic understanding of previous attacks on cryptosystems with the aim of preventing future attacks.

Course Objectives:

1. To understand basics of Cryptography and Network Security.
2. To learn encrypt and decrypt messages using block ciphers.
3. Understanding existing authentication and key agreement protocols.
4. Understanding e-mail and file security software, PGP, and efficiently use the code to encrypt and sign messages.
5. Understanding and analysing SSL or Firewall based solutions against security threats, employ access control techniques.

UNIT I 9 Hrs

Classical Encryption Techniques: Security attacks - Security services and mechanisms - A model for Network Security – Classical encryption techniques - Symmetric cipher model - Substitution techniques - Caesar Cipher – Mono alphabetic Cipher - Play fair Cipher - Hill Cipher - Transposition techniques.

UNIT II 9 Hrs

Block Ciphers- Data Encryption Standards and Public Key Cryptography: Simplified DES - Block Cipher Principles - DES – AES - Block Cipher Design Principles - Block Cipher modes of Operation - Public Key Cryptography - Principles of Public Key Cryptosystems - The RSA Algorithm -Diffie Hellman Key Exchange.

UNIT III 9 Hrs

Message Authentication Codes - Hash Functions and Digital Signatures: Message Authentication Requirements - Message Authentication Functions - Message Authentication Codes - Hash Functions - Security of Hash Functions and MACs - Hash algorithms – SHA – HMAC - Digital Signatures -Digital Signature Standard (DSS) - Authentication applications – Kerberos - X.509 Authentication Service.

UNIT IV 9 Hrs

Electronic Mail and IP Security: Pretty good privacy - S/MIME - IPsec overview – architecture - Authentication Header and Encapsulating security pay load - combining security associates.

UNIT V **9 Hrs**

Web Security-Intruders-Firewalls: Web security considerations - Secure socket layer and transport layer security - Secure electronic transaction - Intruders - Intrusion detection - Password management - Firewall design and principles - Trusted systems.

Course Outcomes:

By the end of the course the student:

1. Identify computer and network security threats, classify the threats and develop a security model to prevent, detect and recover from the attacks.
2. Able to encrypt and decrypt the messages.
3. Analyze and compare the existing authentication codes and key agreement protocols.
4. Apply e-mail and file security software's.
5. Analyze different attacks on networks and evaluate the performance of security protocols like SSL, TLS and firewalls.

Text Books:

1. Cryptography and Network Security: Principles and Practices,8/e, William Stallings, Global Edition, 2023, Pearson Education.
2. Network Security and Cryptography, 1/e, Bernard Menezes, 2010, Thomson Press Ltd, USA.

Reference Books:

1. Principles and Practices of Information Security,4/e, Michal E. Whitman and Herbert J. Mattord, 2012, Cengage Learning, New Delhi.
2. Network Security Essentials (Applications and Standards), 4/e, William Stallings Pearson Education.
3. Hack Proofing your network , 2/e ,Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn IdoDubrawsky, Steve W.Manzuik and Ryan Permeh, wiley Dreamtech, 2002.
4. Fundamentals of Network Security, 1/e, Eric Maiwald (Dreamtech press) ,2008.
5. Network Security - Private Communication in a Public World,2/e, Charlie Kaufman, Radia Perlman and Mike Speciner,2002, Pearson/PHI.

SOTT3401n PRINCIPLES OF PROGRAMMING LANGUAGES

	L	T	P	C
	3	0	0	3

Prerequisites

1. A course on "Mathematical Foundations of Computer Science"
2. A course on "Computer Programming and Data Structures"

Course Description:

This course presents examples of important programming languages and paradigms such as LISP, ALGOL, JAVA, C# and C++. Students write sample programs in some of the languages studied. The languages are used to illustrate programming language constructs such as binding, binding times, data types and implementation, operations (assignment data-type creation, pattern matching), data control, storage management, parameter passing, and operating environment.

Course Objectives:

1. Introduce important paradigms of programming languages
2. To provide conceptual understanding of high-level language design and implementation
3. Topics include programming paradigms; syntax and semantics; data types, expressions and statements; subprograms and blocks; abstract data types; concurrency; functional and logic programming languages; and scripting languages.
4. To analyse the concept of concurrency and exceptional handling mechanism.
5. To apply the concept of functional and logical programming**.**

UNIT I 9 Hrs

Preliminary Concepts: Reasons for Studying Concepts of Programming Languages, Programming Domains, Language Evaluation Criteria, Influences on Language Design, Language Categories, Language Design Trade-Offs, Implementation Methods, Programming Environments Syntax and Semantics: General Problem of Describing Syntax and Semantics, Formal Methods of Describing Syntax, Attribute Grammars, Describing the Meanings of Programs

UNIT II 9 Hrs

Names, Bindings, and Scopes: Introduction, Names, Variables, Concept of Binding, Scope, Scope and Lifetime, Referencing Environments, Named Constants

Data Types: Introduction, Primitive Data Types, Character String Types, User Defined Ordinal Types, Array, Associative Arrays, Record, Union, Tuple Types, List Types, Pointer and Reference Types, Type Checking, Strong Typing, Type Equivalence

Expressions and Statements: Arithmetic Expressions, Overloaded Operators, Type Conversions, Relational and Boolean Expressions, Short Circuit Evaluation, Assignment Statements, Mixed-Mode Assignment **Control Structures**: Introduction, Selection Statements, Iterative Statements, Unconditional Branching, Guarded Commands.

UNIT III **9 Hrs**

Subprograms and Blocks: Fundamentals of Sub-Programs, Design Issues for Subprograms, Local Referencing Environments, Parameter Passing Methods, Parameters that Are Subprograms, Calling Subprograms Indirectly, Overloaded Subprograms, Generic Subprograms, Design Issues for Functions, User Defined Overloaded Operators, Closures, Coroutines

Implementing Subprograms: General Semantics of Calls and Returns, Implementing Simple Subprograms, Implementing Subprograms with Stack-Dynamic Local Variables, Nested Subprograms, Blocks, Implementing Dynamic Scoping

Abstract Data Types: The Concept of Abstraction, Introductions to Data Abstraction, Design Issues, Language Examples, Parameterized ADT, Encapsulation Constructs, Naming Encapsulations

UNIT IV **9 Hrs**

Concurrency: Introduction, Introduction to Subprogram Level Concurrency, Semaphores, Monitors, Message Passing, Java Threads, Concurrency in Function Languages, Statement Level Concurrency. **Exception Handling and Event Handling:** Introduction, Exception Handling in Ada, C++, Java, Introduction to Event Handling, Event Handling with Java and C#.

UNIT V **9 Hrs**

Functional Programming Languages: Introduction, Mathematical Functions, Fundamentals of Functional Programming Language, LISP, Support for Functional Programming in Primarily Imperative Languages, Comparison of Functional and Imperative Languages

Logic Programming Language: Introduction, an Overview of Logic Programming, Basic Elements of Prolog, Applications of Logic Programming. Scripting Language: Pragmatics, Key Concepts, Case Study: Python – Values and Types, Variables, Storage and Control, Bindings and Scope, Procedural Abstraction, Data Abstraction, Separate Compilation, Module Library.

Course Outcomes:

After completion of the course, students will be able to

1. Acquire the skills for expressing syntax and semantics in formal notation
2. Identify and apply a suitable programming paradigm for a given computing application
3. Gain knowledge of and able to compare the features of various programming languages
4. Gain knowledge regarding how to handle exceptions in different programming languages.
5. To get knowledge in Functional Programming Languages and Logic Programming Languages

Text Books:

1. Concepts of Programming Languages Robert. W. Sebesta 10/E, Pearson Education.
2. Programming Language Design Concepts, D. A. Watt, Wiley Dreamtech, 2007.

Reference Books:

1. Programming Languages, 2nd Edition, A.B. Tucker, R. E. Noonan, TMH.
2. Programming Languages, K. C. Louden, 2nd Edition, Thomson, 2003.

SOTT3401o UNIX AND SHELL PROGRAMMING L T P C
3 0 0 3

Prerequisite: Operating System

Course Description:

This course provides an in-depth exploration of the Unix operating system and its command-line environment. We will gain hands-on experience in utilizing Unix commands, understanding shell scripting, and working with various Unix shells and develop a strong foundation in Unix fundamentals and the essential skills needed to navigate, manage files, write scripts, and perform system tasks efficiently.

Course Objectives:

1. Able to understand the fundamental concept of Unix.
2. Able to understand the fundamental concept of Shell.
3. Develop skills to design regular expression feature with Grep, Sed and AWK.
4. Inculcate skill on korn shell features for construct Korn shell programming for the given task.
5. Develop skill to apply various UNIX system calls in designing different UNIX utilities.

UNIT I Introduction to UNIX 9 Hrs

The UNIX Architecture - Features of UNIX - Internal And External Commands - Command Structure, Accessing Unix, Date, Calculator, Change Password, Listing Directories and Files, Who Are You, Creating Files, Editing Files, Display Content of a File, Counting Words in a File, Copying Files, Renaming Files, Deleting Files, Unix Directories, Creating Parent Directories, Changing Directories, Renaming Directories, Unix File Permission, Changing Owners and Groups, Mount and unmount, Arieve Operation, Networking Commands.

UNIT II Overview of Shells 9 Hrs

Unix Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Shell Environment, Customization, Filters: Introduction, Concatenating files, Display Beginning and End of files, Sorting, Translating Characters, Ordering a File, uniq.

UNIT III Regular Expressions and Functions 9 Hrs

Atoms: operators GREP, Operations, grep Family, Searching for File Content, SED: Scripts, Operations, Addresses, Applications, grep and sed, AWK: Execution, Fields and Records, Operations, Patterns, Actions, Associative Arrays, String Functions, String Functions, Mathematical Functions, User Defined Functions, awk and grep, sed and awk.

UNIT IV Interactive Korn Shell 9 Hrs

Introduction, Korn Shell Features, Two Special Files, Variables, Exit Status of a Command, eval Command, Environmental Variables, Options, Startup Scripts, Command History, Command Execution Process, Basic Script concepts, Expressions, Decisions Making Scripts, Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.

UNIT V Interactive C Shell and Communications **9 Hrs**

C shell features, Two Special Files, Variables, Output, Input, Exit Status of a Command, eval Command, Environmental Variables, On-Off Variables, Startup and Shutdown Scripts, Command History, Command Execution Scripts, Fundamentals of C Shell Programming, Communications, Email.

Course Outcomes:

1. Demonstrate knowledge on fundamentals of UNIX operating system, Analyze Unix general purpose, file handling and Networking commands and utilities.
2. Review and identify various features of Unix shell.
3. Apply Regular Expressions to search and manipulate text data in Unix files using tools like grep, sed, and awk.
4. Demonstrate Shell Knowledge of different Unix shells, including the Korn shell and C shell, and their distinctive features.
5. Design Functional scripts with decision-making structures, loops, user-defined functions, and error handling.

Text Books:

1. Unix and shell Programming, Behrouz A. Forouzan and Richard F. Gilbery, 1stEdition, Cengage Learning India, 2003.
2. Unix Concepts and Applications, Sumitabha Das, 4th Edition, TMH, 2006

Reference Books:

1. Unix Shell programming, Yashwanth Kanitkar, 1st Edition, BPB Publisher, 2010.
2. Advanced Unix programming, N.B Venkateswarlu, 2nd Edition, BS Publications, 2010.
3. Unix for programmers and users, Graham Glass, King Ables, 3rd Edition, Pearson Education, 2008.

SOTT3401p **INTRODUCTION TO PSYCHOLOGY**

L	T	P	C
3	0	0	3

Course Description:

This course introduces students to the fundamental principles of psychology and explores the psychological processes underlying human behavior and cognition. The course will emphasize the relevance of psychological concepts to the field of Computer Science.

Course Objectives:

The course should enable the students to:

1. Understand the key concepts and historical foundations of psychology.
2. Describe the biological foundations of behavior and their relevance to cognitive processes.
3. Apply psychological principles to real-world scenarios in technology and Computer Science.
4. Analyze and interpret basic research in psychology.
5. Recognize the impact of psychological factors on individual well-being and interactions with technology.

UNIT I **9 Hrs**

Introduction to Psychology, Definition and scope of psychology, Historical perspectives in psychology, Major branches of psychology, Careers in psychology and their relevance to Computer Science.

UNIT II **9 Hrs**

Research Methods and Ethics, Scientific method in psychology, Experimental, correlation, and observational research, Ethical considerations in psychological research, Pseudoscience, critical thinking, and evaluating online information.

UNIT III **9 Hrs**

Biological Foundations of Behavior, Neurons and the nervous system, Brain structure and function, neural communication and neurotransmitters, Impact of biology on perception, memory, and decision-making.

UNIT IV **9 Hrs**

Learning and Memory, Classical and operant conditioning, Cognitive processes in learning and memory, Different types of memory and factors affecting memory retention, Strategies for improving learning and memory (relevant to programming), Cognitive Processes and Problem Solving, Information processing model, Attention, memory, and decision making, Problem solving, decision making, and critical thinking skills, Application of cognitive psychology to debugging and algorithm design.

UNIT V **9 Hrs**

Social Psychology, Social influence: conformity, obedience, and compliance, Attitudes, persuasion, and social cognition, Group dynamics and collaboration in virtual environments, Online identity, self-presentation, and social media psychology, Mental Health and Stress

Management, Common mental health disorders and their prevalence, Stress, coping strategies, and mental resilience, Digital well-being and managing technology-related stress, Resources for mental health support in the tech industry.

Course Outcomes:

By the end of this course, students should be able to:

1. Student can demonstrate knowledge of key psychological concepts, theories, and historical developments.
2. Apply psychological principles to analyze human behavior, cognition, and interactions with technology.
3. Interpret and critically evaluate psychological research and its implications.
4. Communicate effectively about psychological concepts in written and verbal forms.
5. Recognize the importance of mental well-being and ethical considerations in technology-related contexts.

Text Books:

1. Wade, C. & Tavris, C. (1999) Invitation to psychology. New York: Longman.
2. Coon, Dennis. Introduction to Psychology: Exploration and Application (seventh edition). Minneapolis/St. Paul: West Publishing Company, 1995.

Reference Books:

1. "Psychology" by David G. Myers
2. "Introduction to Psychology" by James W. Kalat
3. "Psychology: Themes and Variations" by Wayne Weiten

SOTT3401q	INDUSTRY 4.0	L T P C
		3 0 0 3

Course Description:
The Industry 4.0 aims to the “smart” and connected production systems that are designed to sense, predict, and interact with the physical world, so as to make decisions that support production in real-time. In manufacturing, it can increase productivity, energy efficiency, and sustainability.

Course Objectives:
The objective of this course is to make students:
1. To impart basic idea in Industry 4.0.
2. To provide students with good depth of knowledge of designing Industrial 4.0 Systems for various application.
3. To learn the artificial intelligence and machine learning techniques/ tools in health care.
4. To understand the bigdata technology and its applications in health care.
5. To learn the design and analysis of Industry 4.0 systems for healthcare applications.

UNIT I **9 Hrs**
Introduction: 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 **9 Hrs**
Cyber Physical System: Introduction to Cyber Physical Systems (CPS), Architecture of CPS- Components, Data science and technology for CPS, Emerging applications in CPS in different fields. Case study: Application of CPS in health care domain.

UNIT III **9 Hrs**
Artificial Intelligence & Machine Learning: Artificial Intelligence: Artificial Intelligence (AI) – What & 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-Applications areas of Machine Learning in Health care.

UNIT IV **9 Hrs**
Big Data & Cloud Computing: What is Big Data, Evolution of Big Data, sources of Big Data? Characteristics of Big Data Vs – Big Data Myths- Data Discovery-Traditional Approach, Big Data Technology: Big Data Technology Process– Applications of Bigdata in Healthcare.
Cloud Computing: Need– Definition – Types of Cloud-Types of Services– SaaS, PaaS, Iaas

UNIT V **9 Hrs**
Impact of Industry 4.0 on Healthcare Industry: An introduction Discover how Industry 4.0 is impacting and transforming the Healthcare Industry including self-diagnosis systems for patients, real-time diagnosis, 3D printed organs and Internet-of-Medical Things (IOMT).

Course Outcomes:
Upon completion of the course, student will be able to:
1. Understand the basic concepts of Industry 4.0 and the other related fields

2. Analyze, design and develop systems to solve the Engineering problems by integrating thermal, design and manufacturing Domains.
3. Understand the various artificial intelligence and machine learning tools in health care domain.
4. Apply bigdata technology in health care applications.
5. Apply the learned Engineering knowledge for the Development of society and self.

Text Books:

1. Jean-Claude André, ―Industry 4.0, Wiley- ISTE, July 2019, ISBN: 781786304827, 2019.
2. Diego Galar Pascual, Pasquale Daponte, Uday Kumar, ―Handbook of Industry 4.0 and SMART Systems, Taylor and Francis,2020

Reference Books:

1. P. Kaliraj, T. Devi, BigDataApplicationsinIndustry4.0, 2022, ISBN9781032008110, CRC Press, Taylor & Francis Group
2. P. Kaliraj, Devi Thirupathi, "Artificial Intelligence Theory, Models and Applications", Auerbach Publications, CRC Press, Taylor and Francis group, 2021.
3. Ethem Alpaydin, "Introduction to Machine Learning", Third Edition, MIT Press, 2014.
4. P. Kaliraj, T. Devi, Industry 4.0 and Education: Transformative Technology and Applications, 2022, CRC Press, Taylor & Francis Group.

SOTT3401r	COMPUTER VISION	L T P C
		3 0 0 3

Course Description:

Computer vision is a field of artificial intelligence (AI) that enables computing systems to extract meaningful information from digital images, videos, and other visual inputs to make computable decisions. This course aims to provide a comprehensive overview of computer vision. This course emphasizes computer vision principles and highlights their application in the real world.

Course Objectives:

1. Review image processing techniques for computer vision.
2. Understand shape and region analysis.
3. Understand Hough Transform and its applications to detect lines, circles, ellipses.
4. Implement three-dimensional image analysis techniques.
5. Design some applications using computer vision algorithms

UNIT I **9 Hrs**

INTRODUCTION: Image Processing - Computer vision and computer graphics - What is computer vision - Low-level, Midlevel, High-level - Overview of diverse computer vision applications: Document image analysis - Biometrics - Object recognition - Tracking - Medical image analysis - Content-based image retrieval - Video data processing - Multimedia - Virtual reality and augmented reality.

UNIT II **9 Hrs**

IMAGE FORMATION MODELS: Monocular imaging system - Radiosity: The Physics 'of image formation - Radiance, Irradiance, BRDF, colour etc. - Orthographic and perspective projection - Camera model and camera calibration – Binocular imaging systems - Multiple views geometry - Structure determination - Shape from shading - Photometric Stereo - Depth from defocus - Construction of 3D model from images.

UNIT III **9 Hrs**

IMAGE PROCESSING AND MOTION ESTIMATION: Image preprocessing - Image representations (continuous and discrete) - Edge detection.

Regularization theory - Optical computation - Stereo Vision - Motion estimation - Structure from motion.

UNIT IV **9 Hrs**

SHAPE REPRESENTATION AND SEGMENTATION : Contour based representation - Region based representation - Deformable curves and surfaces - Snakes and active contours - Level set representations - Fourier and wavelet descriptors – Medial representations - Multiresolution analysis.

UNIT V **9 Hrs**

OBJECT RECOGNITION AND IMAGE UNDERSTANDING : Hough transforms and other simple object recognition methods - Shape correspondence and shape matching - Principal Component Analysis - Shape priors for recognition - Pattern recognition methods - HMM, GMM and EM - Application: Surveillance – Foreground background separation – Particle filters – Chamfer matching, tracking, and occlusion – Combining views from multiple cameras – Human gait analysis - Applications: In-vehicle vision system: Locating roadway – Road markings – Identifying road signs – Locating pedestrians.

Course Outcomes:

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

1. Understand the image processing techniques for computer vision.
2. Analyse the shape and region analysis techniques for computer vision.
3. Analyse the Hough Transform and its applications to detect lines, circles, ellipses.
4. Implement the concept of three-dimensional image analysis techniques.
5. Develop some applications with the help of various computer vision algorithms

Text Books:

1. David A. Forsyth, Jean Ponce, ‖Computer Vision: A Modern Approach‖, 2nd Edition, Pearson Education Limited, 2015
2. E. Trucco and A. Verri, ―Introductory Techniques for 3D Computer Vision‖, Prentice Hall, 1998.

Reference Books:

1. Mark Nixon and Alberto S. Aquado, ―Feature Extraction and Image Processing for Computer
2. Vision‖, 3rd Edition, Academic Press, 2012.
3. E. R. Davies, ―Computer and Machine Vision‖, 4th Edition, Academic Press, 2012.
4. Richard Szeliski, ―Computer Vision: Algorithms and Applications (CVAA)‖, Springer, 2010.
5. Simon J. D. Prince, ―Computer Vision: Models, Learning, and Inference‖, Cambridge University.

Program Elective -I

BTCT3601a **SOFTWARE TESTING METHODOLOGIES** **L T P C**
3 0 0 3

Prerequisites:
Basic understanding of the software development life cycle (SDLC). Basic understanding of software programming using any programming language.

Course Description:
Testing methodologies in software engineering are testing strategies, approaches, or methods used to test a specific product to ensure its usability. It makes sure that the product works as per the given specifications and has no side effects when used outside the design parameters. Software testing methodologies encompass everything from unit testing to integration testing and specialized form of testing like security or performance testing.

Course Objectives:
The course should enable the students to:

1. Study the fundamental concepts of software testing which includes objectives, process, criteria, strategies, and methods.
2. Discuss various software testing types and levels of testing like black and white box testing along with levels unit test, integration, regression, and system testing.
3. It also helps to learn the types of bugs, testing levels with which the student can very well identify a bug and correct as when it happens.
4. It provides knowledge on transaction flow testing and data flow testing techniques so that the flow of the program is tested as well.
5. To learn the domain testing, path testing and logic-based testing to explore the testing process easier.

UNIT I **9 Hrs**
Introduction: Purpose of Testing, Dichotomies, Model for Testing, Consequences of Bugs, Taxonomy of Bugs.

UNIT II **9 Hrs**
Flow Graphs and Path Testing: Basic concepts of Path Testing, Predicates, Path Predicates and Achievable Paths, Path Sensitizing, Path Instrumentation, Application of Path Testing.
Transaction Flow Testing: Transaction Flows, Transaction Flow Testing Techniques.

UNIT III **9 Hrs**
Data - Flow Testing: Basics of Data-Flow Testing, Strategies in Data - Flow Testing, Application of Data - Flow Testing.
Domain Testing: Domains and Paths, Nice & Ugly Domains, Domain Testing, Domains and Interface Testing, Domains and Testability.

UNIT IV **9 Hrs**

Paths, Path Products and Regular Expressions: Path Products and Path Expressions, Reduction Procedure, Applications, Regular Expressions & Flow Anomaly Detection.

Logic Based Testing: Overview, Decision Tables, Path Expressions, KV charts, Specifications.

UNIT V **9 Hrs**

State, State Graphs and Transition Testing: State Graphs, Good and Bad State Graphs, State Testing, Testability Tips. Graph Matrices and Application: Motivational Overview, Matrix of Graph, Relations, Powers of a Matrix, Node Reduction Algorithm, Building Tools.

Course Outcomes:

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

1. Know the basic concepts of software testing and its essentials.
2. Able to identify the various bugs and correcting them after knowing the consequences of the bug.
3. Use of program's control flow as a structural model is the corner stone of testing.
4. Analyze the path products, regular expressions and logic based testing.
5. Performing functional testing using control flow and transaction flow graphs.

Text Books:

1. Boris Beizer, Dreamtech, Software Testing Techniques, Second Edition, 2002.
2. Dr. K. V. K. K. Prasad, Software Testing Tools, Dreamtech, 2004.

Reference Books:

1. Brian Marick, The Craft of Software Testing, Prentice Hall, 1994.
2. Edward Kit, Software Testing in the Real World, Pearson, First Edition, 2002.
3. William E. Perry, Effective methods of Software Testing, Third Edition, Wiley, 2006.
4. Glenford J. Meyers, Art of Software Testing, Third Edition, John Wiley, 2011.

BTCT3601b **DISTRIBUTED COMPUTING** **L T P C**
3 0 0 3

Course Description:
This course covers general introductory concepts in the design and implementation of distributed systems. It covers scheduling in multiprocessors, memory hierarchies, synchronization, concurrency control, fault tolerance, data-parallel programming models, scalability studies, distributed memory message passing systems, shared memory programming models, tasks, dependence graphs, and program transformations, parallel I/O, applications, tools.

Course Objectives:
The objective of this course is to make students to:
1. To gain knowledge in the design of distributed systems
2. To explore the algorithms that support distributed computing.
3. To provide practical exposure to the design
4. To provide knowledge of the functioning of existing distributed systems
5. To unveil the basic concepts of fault tolerance systems

UNIT I **9 Hrs**
Fundamentals of distributed systems: Introduction to Distributed Computing System-Evolution of Distributed Computing Systems-Distributed Computing System Models - Gaining Popularity of Distributed Computing Systems-Distributed Operating System- Issues in Designing a Distributed Operating System- Introduction to Distributed Computing Environment (DCE)

UNIT II **9 Hrs**
Communication in distributed systems: Message Passing- Introduction- Desirable Features of a Good Message-Passing System - Issues in IPC by Message Passing - Synchronization-Buffering- Multidatagram Messages - Encoding and Decoding of Message Data - Process Addressing - Failure Handling

UNIT III **9 Hrs**
Memory and synchronization: General Architecture of DSM Systems - Design and Implementation Issues of DSM – Granularity - Structure of Shared Memory Space - Replacement Strategy – Thrashing - Other Approaches to DSM - Heterogeneous DSM - Advantages of DSM - Advantages of DSM - Event Ordering - Mutual Exclusion – Deadlock - Election Algorithms

UNIT IV **9 Hrs**
Resource, process management and naming: Desirable Features of a Good Global Scheduling Algorithm - Task Assignment Approach – Load Balancing Approach - Load-Sharing Approach - Process Migration - Threads - Desirable Features of a Good Naming System - Fundamental Terminologies and Concepts - System-Oriented Names - Object-Locating Mechanisms - Human-Oriented Names - Name Caches - Naming and Security

UNIT V **9 Hrs**

Distributed file systems and security: Desirable Features of a Good Distributed File System - File Models - File-Accessing Models – File Sharing Semantics - File-Caching Schemes - File Replication - Fault Tolerance - Atomic Transactions - Design Principles - Potential Attacks to Computer Systems

Course outcomes:

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

1. Know the design of distributed systems
5. Understand and implement the algorithms of distributed systems
6. Illustrate principles and importance of distributed operating system
7. Implement distributed client-server applications using remote method invocation
8. Distinguish between centralized systems and distributed systems. Get exposed to the fault tolerant systems

Text Books:

1. Pradeep K. Sinha, "Distributed Operating Systems Concepts and Design", PHI, 2007
2. Hwang, K., Dongarra, J., & Fox, G. C. (2013). Distributed and cloud computing: from parallel processing to the internet of things. Morgan kaufmann.

Reference Books:

1. Andrew S. Tannenbaum, Maarten Van Steen, "Distributed Systems- Principles and Paradigms" , Second Edition, PHI, 2007
2. Le, D. N., Kumar, R., Mishra, B. K., Chatterjee, J. M., & Khari, M. (Eds.). (2019). Cyber Security in Parallel and Distributed Computing: Concepts, Techniques, Applications and Case Studies. John Wiley & Sons.
3. Chen, C., Zhang, Y., Wang, Z., Wan, S., & Pei, Q. (2021). Distributed computation offloading method based on deep reinforcement learning in ICV. Applied Soft Computing, 103, 107108.

BTCT3601c ADVANCED JAVA PROGRAMMING L T P C
3 0 0 3

Course Description:

This course has been introduced to make students to focus on advance programming concepts of Java Language. This course also provides opportunities to familiarizes various tools and techniques. The concepts like Java Servlets, JSP, EJB and Spring Framework.

Course Objectives:

1. To introduce the basics of enterprise architecture models and session tracking.
2. To understand JSP and to write custom tags.
3. To impart knowledge on the development of Enterprise Java Beans and advanced Java programming concepts.
4. To analyse the EJB Middleware Architecture, relationships and EJB container services.
5. To apply Spring Framework and Hibernate and its mapping.

UNIT I 9 Hrs

INTRODUCTION AND DATABASE PROGRAMMING: J2EE Platform – Enterprise architecture styles – J2EE run times – J2EE API – J2EE architecture – Containers – Introduction to J2EE technologies – Naming and directory services. Database programming with JDBC – JDBC/ODBC bridge – Establishing a connection – Creating and executing SQL statements – Querying – Report statements – Scrollable and updatable result sets – Java.Sql packages – JDBC data sources – Connection pooling.

UNIT II 9 Hrs

SERVLET PROGRAMMING: Introduction to Servlet Programming - Servlet implementations - Servlet configuration – Servlet exceptions - Servlet life cycle - Servlet programming - Servlet security- Servlet communication -Advanced servlets: Approach to session tracking- Demonstrating session - Lifecycle with cookies – A simple shopping cart using sessions - Servlet context interface - Servlet collaboration.

UNIT III 9 Hrs

JSP AND JAVA MAIL : Java Server Pages: Intro to JSP - JSP directives - Scripting elements - Standard auctions – Implicit objects - Scope - JSP pages as XML documents - JSP sample program - Design strategies - JSP tag Extensions-A simple TAG - Writing TAG extensions. Java Mail API: Introduction to java mail – Mail protocols- Java mail overview-Quick, Send me a Email: An example program.

UNIT IV 9 Hrs

ENTERPRISE JAVA BEANS : Overview of EJB-EJB Middleware Architecture - EJB architecture- EJB containers and its services - Design of EJB tier - Session java beans- Stateless and stateful beans, Entity beans and persistence - Container Vs bean managed persistence, Message driven bean - Relationships, EJB container services.

UNIT V **9 Hrs**

SPRING FRAMEWORK : Introduction to Spring - spring framework architecture - Spring MVC-Spring ORM - IOC container - Spring event handling - Introduction to Hibernate - Spring JDBC - Hibernate mappings - Spring MVC web framework - Spring AOP framework.

Course Outcomes:

On completion of the course, student will be able to

1. Understand the concept of JDBC connectivity.
2. Analyse the fundamental concept of servlets.
3. Apply the concept of JSP and Java Mail.
4. Implement Java, J2EE applications using Spring framework.
5. Develop enterprise java applications thereby meeting the industrial requirements.

Text Books:

1. Subrahmanyam Allamaraju and Cedric Buest, Professional Java Server Programming J2EE Edition‖, Apress, 2007.
2. Jim Keogh, Completer Reference, J2EE‖, Tata McGraw Hill, 2007.

Reference Books:

1. James Holmes-Struts, The complete Reference‖, 2nd Edition, Tata McGraw Hill, 2007.
2. Rod Johnson et al, ―Professional Java Development with the Spring Framework‖, John Wiley and Sons, 2005.

BTCT3601d **NETWORK SECURITY** **L T P C**
3 0 0 3

Course Description:

This course covers different types of attacks on networks, principles of cryptography: Symmetric Key Cryptography, Public Key Cryptography, Message Integrity, Cryptographic Hash Functions, Authentication, Digital Signatures, Certificates, Firewalls and Intrusion Detection Systems.

Course Objectives:

1. To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
2. To understand various cipher techniques.
3. To explore the various key distribution and management schemes.
4. To learn how to deploy encryption techniques to secure data in transit across data networks.
5. To learn different attacks and system security approaches.

UNIT I **9 Hrs**

Basics of Cryptography: The OSI Security Architecture -Services, mechanisms and attacks - A Model for network security – Classical encryption technique – Symmetric cipher model – Substitution technique – Rotor machines – Steganography.

UNIT II **9 Hrs**

Data Encryption: Stream Cipher - SDES - Block cipher principles – The Data Encryption Standard – The strength of DES – Advanced Encryption Standard - Triple DES.

UNIT III **9 Hrs**

Key Distribution and Key Management: Random key generation- Requirements - Linear Congruential generators- Blum Blum Shub generator Placement of encryption - Traffic confidentiality – Key distribution- Public key cryptography and RSA – Key Management - Diffie-hellman Key exchange.

UNIT IV **9 Hrs**

Network Protection, Monitoring, Detection, Authentication: Firewalls, packet filter and stateful firewalls, application aware firewalls, personal firewalls- Intrusion Detection System- Honeypots - Authentication requirements – Authentication functions – message authentication codes – Hash functions – Security of hash functions and MAC‘S – MD 5 (Message Digest Algorithm) – HMAC. Digital Signatures and authentication protocols: Digital Signatures – Authentication protocols – Digital Signature Standard – Kerberos – X.509 Authentication Service.

UNIT V **9 Hrs**

Attacks and System Security:

Unauthorized access - Distributed Denial of Service (DDoS) attacks- Man in the middle attacks- Code - SQL injection attacks- Privilege escalation- Insider threats- ARP Cache poisoning- MAC flooding, Side- channel attack- The Secure Sockets Layer (SSL)- Pretty Good Privacy (PGP)- Email Security-Web Security-IP Security –Biometric Security.

Course Outcomes:

By the end of the course the student:

1. Able to explain the facts and fundamental ideas of symmetric encryption schemes.
2. Illustrate various encryption standards and its challenges in the network.
3. Experiment with key encryption mechanisms and key management strategies in new situations.
4. Design suitable network protection, monitoring and detection strategies that detect or prevent from the threat.
5. Design security strategies and resolve security issues in networks and computer systems to secure an organization / IT infrastructure.

Text Books:

1. William Stallings, Cryptography and Network Security: Principles and Practice, 8th Edition, Pearson edition, 2020.
2. Behrouz A. Forouzan, Cryptography and Network Security, McGraw-Hill, 3rd Edition 2015.

Reference Books:

1. W. Stallings, Network Security Essentials: Applications and Standards,6th Edition, Pearson Prentice Hall, 2016.
2. Bryan Sullivan and Vincent Liu, Web Application Security, A Beginner's Guide, McGraw-Hill Education, 2012.
3. C. Kaufman, R. Perlman and M. Speciner, Network Security: Private Communication in a Public World, 2nd Edition, Prentice Hall PTR, 2002.

BTCT3601e: **DATABASE SECURITY** **L T P C**

3 0 0 3

Course Description:

Database security concerns the use of a broad range of information security controls to protect databases (potentially including the data, the database applications or stored functions, the database systems, the database servers and the associated network links) against compromises of their confidentiality, integrity and availability. It involves various types or categories of controls, such as technical, procedural/administrative and physical. Database security is a specialist topic within the broader realms of computer security information security and risk management.

Course Objectives:

1. To learn the security of databases
2. To learn the design techniques of database security
3. To learn the secure software design
4. To analyse Statistical Database Protection & Intrusion Detection Systems
5. To understand models for the Protection of new Generation Database Systems

UNIT I **9 Hrs**

Introduction: Introduction to Databases Security Problems in Databases, Security Controls Conclusions. **Security Models –1:** Introduction Access Matrix Model, Take-Grant Model, Acten Model, PN Model, Hartson and Hsiao's Model, Fernandez's Model, Bussolati and Martella's Model for Distributed databases.

UNIT II **9 Hrs**

Security Models -2: Bell and LaPadula's Model, Biba's Model, Dion's Model, Sea View Model, Jajodia and Sandhu's Model. The Lattice Model for the Flow Control conclusion. **Security Mechanisms:** Introduction User Identification/Authentication, Memory Protection, Resource Protection Control Flow Mechanisms. Isolation Security Functionalities in Some Operating Systems, Trusted Computer System, Evaluation Criteria.

UNIT III **9 Hrs**

Security Software Design: Introduction, A Methodological Approach to Security Software, Design Secure Operating System, Design Secure DBMS, Design Security Packages, Database Security Design. **Statistical Database Protection & Intrusion Detection Systems:** Introduction Statistics Concepts and Definitions, Types of Attacks, Inference Controls evaluation, Criteria for Control Comparison. Introduction IDES System, RETISS System, ASES System Discovery.

UNIT IV **9 Hrs**

Models for the Protection of new Generation Database Systems -1: Introduction, A Model for the Protection of Frame Based Systems, A Model for the Protection of Object Oriented Systems, SORION Model for the Protection of Object-Oriented Databases.

UNIT V **9 Hrs**

Models for the protection of new Generation Database Systems -2: The Orion Model, Jajodia and Kogan's Model, A Model for the Protection of Active Databases Conclusions.

Course Outcomes:

1. Able to explain various security models.
2. Able to analyze and apply security mechanisms.
3. Able to design and implement secure database systems.
4. Able to identify security threats in database systems.
5. Able to solve complex problems in a database system by using protection models.

Text Books:

1. Database Security and Auditing, Hassan A. Afyouni, India Edition, CENGAGE Learning, 2009.
2. Database Security, Castano, Second edition, Pearson Education.

Reference Book:

1. Database security by alfred basta, melissa zgola, CENGAGE learning

BTCT3302 ENTREPRENEURSHIP AND START UP MANAGEMENT L T P C
3 0 0 0

Course Description: This course is intended to help the students to learn the basic concepts and functions of entrepreneurship and its importance in building startups and provide regional employment opportunities and sustainability

Course Objectives:

3. Introducing fundamental concepts of entrepreneurship
2. To obtain knowledge of organisational assistance available to entrepreneurs
2. Introducing various aspects related to marketing inputs for entrepreneurs
3. To provide meaningful inputs for start up management
4. To make students knowledgeable about start up survival and growth

UNIT I Introduction to Entrepreneurship 12 Hrs

Entrepreneurship- Scope, Factors affecting growth of entrepreneurship, Entrepreneurship Development program, Characteristics and qualities of an entrepreneur, identification of business opportunities

UNIT II Organisational Assistance to Entrepreneurs 8 Hrs

Assistance to an entrepreneur, New Ventures, Industrial Park (Meaning, features), Financial assistance by different agencies, Export oriented units, Industrial estates

UNIT III Marketing for entrepreneurs 8 Hrs

Product Management, Marketing research and consumer behaviour, Pricing, Advertising and sales promotion, Rural marketing, Export marketing

UNIT IV Start-up Management 8 Hrs

The rise of startup economy, Startup ideation and venture choices, Startup capital requirements, funding start-ups with bootstrapping- crowd funding

UNIT V Start-up Survival and Growth: 8 Hrs

Stages of growth in a new venture- Growing with the market - Growing within the industry- Venture life patterns, planning for Harvest and Exit

Course Outcomes:

1. Basic knowledge of fundamental concepts of entrepreneurship
2. Understanding of organisational assistance available to entrepreneurs
3. Understanding and implementing marketing for start ups
4. Basic knowledge of start ups
5. Advanced knowledge of start ups

Text Books:

1. Gupta, B. L., Kumar, A. (2009). Entrepreneurship Development. India: Mahamaya Publishing House.
2. CHOLE, R. R. K. (2012). Entrepreneurship Development And Communication Skills. India: Scientific Publisher (India).

Reference Books:

1. Crane, F. G. (2009). Marketing for Entrepreneurs: Concepts and Applications for New Ventures. United Kingdom: SAGE Publications.
2. Crane, F. G. (2021). Marketing for Entrepreneurs: Concepts and Applications for New Ventures. United States: SAGE Publications.

BTCL3501 FULL STACK WEB DEVELOPMENT LAB

L	T	P	C
0	0	2	1

Course Description:

This course is designed for individuals with a passion for technology and a desire to build robust, end-to-end web solutions. This course focuses on developing full-stack applications, emphasizing the integration of user interface, business logic, and data storage. Throughout this course, you will explore into both front-end and back-end technologies, gaining hands-on experience in creating dynamic and responsive web applications.

Course Objectives:

1. To develop full stack applications with clear understanding of user interface, business logic and data storage.
2. To design and develop user interface screens for a given scenario.
3. To develop the functionalities as web components as per the requirements
4. To implement the database according to the functional requirements
5. To integrate the user interface with the functionalities and data storage.

Lab Experiments

1 a. Write a program to create a simple webpage using HTML.
b. Write a program to create a simple webpage with registration form using HTML and CSS.

2 a. Write a program to validate a registration form using JavaScript.
b. Write a JavaScript to design a simple calculator to perform the following operations: Addition, Subtraction, Multiplication and Division.

3 a. Write a program to create and Build a Password Strength Check using JQuery.
b. Write a program to create and build a star rating system using JQuery.

4. Write a program to create a simple calculator Application using React JS

5 a. Write a program to create a voting application using React JS
b. Create a Simple Login form using React JS

6 a. Using Angular JS Implement an Input Validation
b. Implement AngularJs to display the 10 students details in Table format

7 a. Implement NodeJS Modules
b. Develop CRUP Application using NoSQL(MongoDB) database

Case Study 1: Develop a Tutorial Website
Case Study 2: Develop an online survey application

Course Outcomes:

1. Design and implement responsive and user-friendly front-end interfaces using HTML5, CSS3, and JavaScript.

2. Apply front-end frameworks (e.g., React, Angular) to create dynamic and interactive web applications
3. Develop server-side logic using languages like Node.js
4. Perform CRUD operations, transactions, and ensure data integrity in both SQL and NoSQL databases
5. Integrate all the necessary components of the application

BTCL3502 DATA WAREHOUSING AND MINING LAB

	L	T	P	C
	0	0	2	1

Course Description:

This lab is to impart the knowledge on how to implement classical models and algorithms in data warehousing and data mining and to characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering. At the end to compare and contrast different conceptions of data mining.

Course Objectives:

The objective of this lab is to make students to

1. Identify different attributes of credit assessment and develop a decision tree, classify the data with 100% accuracy.
2. Test, cross validate and preprocess the data.
3. How to obtain the good results.
4. How to make the decision tree simpler by applying reduce error pruning.
5. Derive associations from dataset and do clustering using weka.

Description: The business of banks is making loans. Assessing the credit worthiness of an applicant is of crucial importance. You have to develop a system to help a loan officer decide whether the credit of a customer is good, or bad. A bank's business rules regarding loans must consider two opposing factors. On the one hand, a bank wants to make as many loans as possible. Interest on these loans is the banks profit source. On the other hand, a bank cannot afford to make too many bad loans. Too many bad loans could lead to the collapse of the bank. The bank's loan policy must involve a compromise: not too strict, and not too lenient.

To do the assignment, you first and foremost need some knowledge about the world of credit. You can acquire such knowledge in a number of ways.

1. Knowledge Engineering. Find a loan officer who is willing to talk. Interview her and try to represent her knowledge in the form of production rules.
2. Books. Find some training manuals for loan officers or perhaps a suitable textbook on finance. Translate this knowledge from text form to production rule form.
3. Common sense. Imagine yourself as a loan officer and make up reasonable rules which can be used to judge the credit worthiness of a loan applicant.
4. Case histories. Find records of actual cases where competent loan officers correctly judged when, and when not to, approve a loan application. **The German Credit Data**:

Actual historical credit data is not always easy to come by because of confidentiality rules. Here is one such data set, consisting of 1000 actual cases collected in Germany. Credit dataset (original) Excel spreadsheet version of the German credit data (Down load from web).

In spite of the fact that the data is German, you should probably make use of it for this assignment. (Unless you really can consult a real loan officer !)

A few notes on the German dataset

- DM stands for Deutsche Mark, the unit of currency, worth about 90 cents Canadian (but looks and acts like a quarter).
- Owns telephone. German phone rates are much higher than in Canada so fewer people own telephones.
- foreign_worker. There are millions of these in Germany (many from Turkey). It is very hard to get German citizenship if you were not born of German parents.
- There are 20 attributes used in judging a loan applicant. The goal is the classify the applicant into one of two categories, good or bad. **Subtasks: (Turn in your answers to the following tasks)**

1. A) List all the categorical (or nominal) attributes and the real, valued attributes separately.

   C) What attributes do you think might be crucial in making the credit assessment? Come up with some simple rules in plain English using your selected attributes.

2. A) One type of model that you can create is a Decision Tree, train a Decision Tree using the complete dataset as the training data. Report the model obtained after training.
   B) Suppose you use your above model trained on the complete dataset, and classify credit good/bad for each of the examples in the dataset. What % of examples can you classify correctly? (This is also called testing on the training set) Why do you think you cannot get 100 % training accuracy?

3. A) Is testing on the training set as you did above a good idea? Why or Why not?
   B) One approach for solving the problem encountered in the previous question is using cross validation? Describe what cross, validation is briefly. Train a Decision Tree again using cross, validation and report your results. Does your accuracy increase/decrease? Why?

4. Check to see if the data shows a bias against "foreign workers" (attribute 20),or "personal, status" (attribute 9). One way to do this (perhaps rather simple minded) is to remove these attributes from the dataset and see if the decision tree created in those cases is significantly different from the full dataset case which you have already done. To remove an attribute you can use the preprocess tab in Weka's GUI Explorer. Did removing these attributes have any significant effect? Discuss.

5. Another question might be, do you really need to input so many attributes to get good results? Maybe only a few would do. For example, you could try just having attributes 2, 3, 5, 7, 10, 17 (and 21, the class attribute (naturally)). Try out some combinations. (You had removed two attributes in problem 7. Remember to reload the Arff data file to get all the attributes initially before you start selecting the ones you want.)

6. Sometimes, the cost of rejecting an applicant who actually has a good credit (case 1) might be higher than accepting an applicant who has bad credit (case 2). Instead of counting the misclassifications equally in both cases, give a higher cost to the first case (say cost 5) and lower cost to the second case. You can do this by using a cost matrix in Weka. Train your

Decision Tree again and report the Decision Tree and cross, validation results. Are they significantly different from results obtained in problem 6 (using equal cost)?

7. A) Do you think it is a good idea to prefer simple decision trees instead of having long complex decision trees? How does the complexity of a Decision Tree relate to the bias of the model?
   B) You can make your Decision Trees simpler by pruning the nodes. One approach is to use Reduced Error Pruning, Explain this idea briefly. Try reduced error pruning for training your Decision Trees using cross, validation (you can do this in Weka) and report the Decision Tree you obtain? Also, report your accuracy using the pruned model. Does your accuracy increase?

8. (Extra Credit): How can you convert a Decision Tree into "if, then, else rules". Make up your own small Decision Tree consisting of 2,3 levels and convert it into a set of rules. There also exist different classifiers that output the model in the form of rules, one such classifier in Weka is rules. PART, train this model and report the set of rules obtained. Sometimes just one attribute can be good enough in making the decision, yes, just one! Can you predict what attribute that might be in this dataset? OneR classifier uses a single attribute to make decisions (it chooses the attribute based on minimum error). Report the rule obtained by training a one R classifier. Rank the performance of j48, PART and one R.

9. Derive association rules from the following dataset.

Outlook	**Temperature**	**Humidity**	**Windy**	**Play**
Sunny	Hot	High	False	No
Sunny	Hot	High	True	No
Overcast	Hot	High	False	Yes
Rainy	Mild	High	False	Yes
Rainy	Cool	Normal	False	Yes
Rainy	Cool	Normal	True	No
Overcast	Cool	Normal	True	Yes
Sunny	Mild	High	False	No
Sunny	Cool	Normal	False	Yes
Rainy	Mild	Normal	False	Yes
Sunny	Mild	Normal	True	Yes
Overcast	Mild	High	True	Yes
Overcast	Hot	Normal	False	Yes
Rainy	Mild	High	True	No

10. Perform Clustering on Weather nominal data set
    A) Open Weka and Load the data set editor. Get familiarize with the editor operations.
       i. Load the weather. Nominal dataset. Use the filter Weka. Unsupervised, instance. Remove with Values to remove all instances in which the humidity attribute has the

value high. To do this, first make the field next to the Choose button show the text Remove with Values. Then click on it to get the Generic Object .Editor window, and figure out how to change the filter settings appropriately.

B) Choosing k,means clustering algorithm for clustering use the Weather nominal data set (.arff) performs clustering with a Euclidean distance functions and visually inspect the nature of the clusters.

C) Classification: Choosing an appropriate filter for classification use the Weather nominal data set (.arff) perform classification and visualize the classification tree.

Course Outcomes:

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

1. Identify, develop and classify the given data with good accuracy score.
2. Test, validate and process the data.
3. Implement the own classification data mining algorithms to get good results.
4. Prune the decision tree to make it simpler.
5. Can cluster the data using weka tools.

Resources:

Andrew Moore's Data Mining Tutorials (See tutorials on Decision Trees and Cross Validation)

- Decision Trees (Source: Tan, MSU)
- Tom Mitchell's book slides (See slides on Concept Learning and Decision Trees)
- Weka resources:

1. Introduction to Weka (html version) (download ppt version)
2. Download Weka
3. Weka Tutorial
4. ARFF format
5. Using Weka from command line

VI SEMESTER

BTCT3303 **AUTOMATA AND COMPILER DESIGN** **L T P C**

3 1 0 4

Prerequisite: Mathematical Foundations of Data Science

Course Description:

Automata and Compiler Design is a foundational computer science course that explores the theoretical underpinnings of formal languages, automata theory, and the design of programming language compilers. This course provides students with a comprehensive understanding of the theoretical concepts and practical applications necessary for building efficient and robust compilers.

Course Objectives:

1. Able to understand the concept of abstract machines, construct FA, Regular Expressions for the regular languages and equivalent FSMs.
2. Able to construct pushdown automata equivalent to Context free Grammars, construct Turing Machines and understand undecidability.
3. Emphasize the concepts learnt in phases of compiler, lexical analyser and Top-down parser.
4. Able to understand the concepts of Bottom-up parser, Intermediate Code Generation.
5. Able to understand the concepts of Code optimizer and Code Generation.

UNIT I: Introduction to Automata and Regular Expressions **12 Hrs**

Introduction, Alphabets, Strings and Languages, Chomsky Hierarchy, Automata and Grammars, Regular Grammar and Language, Finite Automata, Deterministic finite Automata (DFA), Nondeterministic finite Automata (NFA), Equivalence of NFA and DFA, Minimization of Finite Automata, Regular Expressions, Converting Regular Grammar and Expression into Finite Automata, Pumping lemma for regular sets, Closure properties of regular sets (Without proof).

UNIT II: Context Free Grammar and Pushdown Automata **12 Hrs**

Context Free Language, Context Free Grammar, Derivation and Parse tree, Ambiguity, Simplification of CFG's, Chomsky Normal Form, Greibach Normal Form, Push Down Automat (PDA), Design of PDA, Equivalence of PDA and CFL/CFG

UNIT III: Turing Machine and Introduction to Compiler **12 Hrs**

Turing Machine, TM Model, Language acceptance, Design of Turing Machine, Compilers, Phases of Compiler, The role of Lexical Analyzer, Input Buffering.

UNIT IV: Parser and Intermediate Code Generation **12 Hrs**

Parser, Top-Down parsers: Recursive Descent Parsers, Predictive Parsers

Bottom–up Parsers: Shift-Reduce Parsing, LR parsers, Intermediate Code Generation: Three address codes.

UNIT V: Code Optimization and Code Generation **12 Hrs**

Code Optimization: Peephole optimization, Basic blocks and flow graphs, DAG, Principles of Source Code Optimization, Code Generation: Issues in Design of Code Generation, Simple Code Generator.

Course Outcomes:

1. Demonstrate knowledge on Automata Theory, Regular Expression and Analyze and Design of finite automata, and prove equivalence of various finite automata.
2. Demonstrate knowledge on context free grammar, Analyze and design of PDA and TM.
3. Understand the basic concept of compiler design, and its different phases which will be helpful to construct new tools like LEX, YACC, etc.
4. Ability to implement semantic rules into a parser that performs attribution while parsing and apply error detection and correction methods.
5. Apply the code optimization techniques to improve the space and time complexity of programs while programming and Ability to design a compiler.

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. Mishra K L P and Chandrasekaran N, "Theory of Computer Science - Automata, Languages and Computation", 2/e, 2007, PHI, New Delhi, India.
3. Compilers: Principles, Techniques, and Tools, Updated 2e July 2023 Alfred V. Aho , Monica S. Lam, Ravi Sethi , Jeffrey D. Ullman , Sorav Bansal

Reference Books:

1. Introduction to Languages and Theory of Computation, John C Martin, 1/e, 2009, Tata McGraw Hill Education, Hyderabad, India.
2. Introduction to Theory of Computation, Sipser, 2/e, 2005, Thomson, Australia.
3. Compiler Construction: Principles And Practice, Kenneth C. Louden, Thomson/ Delmar Cengage Learning, 2006.
4. Lex & yacc, Doug Brown, John Levine and Tony Mason, 2 nd Edition, O'reilly Media
5. Engineering a compiler, Keith Cooper and Linda Torczon, 2 nd Edition, Morgan Kaufmann, 2011.

BTCT3503 **CLOUD COMPUTING** **L T P C**

3 0 0 3

Course Description:

This course covers topics such as cloud architecture, virtualization, security, and deployment models. Demystifies cloud infrastructure components, including virtual machines, networking, and storage. The students gain foundational knowledge of Hybrid, Multicloud, Microservices, Serverless, Application Modernization, and cloud security and monitoring.

Course Objectives:

The objective of this course is to make students to,

1. Understand the concept of cloud computing.
2. Appreciate the evolution of cloud from the existing technologies.
3. Gain knowledge on the architecture, the services and storage in cloud computing.
4. Familiarize with managing the resources and securing the cloud.
5. Appreciate the emergence of cloud as the next generation computing paradigm.

UNIT I **9 Hrs**

Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.

UNIT II **9 Hrs**

Cloud Enabling Technologies: Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish-Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices –Virtualization Support and Disaster Recovery.

UNIT III **9 Hrs**

Cloud Architecture, Services and Storage: Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds – laaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.

UNIT IV **9 Hrs**

Resource Management and Security in Cloud: Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.

UNIT V **9 Hrs**

Cloud Technologies and Advancements: Hadoop – Map Reduce – Virtual Box — Google App Engine – Programming Environment for Google App Engine — Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.

Course Outcomes:

On Completion of the course, the students should be able to:

1. Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
2. Learn the key and enabling technologies that help in the development of cloud.
3. Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
4. Explain the core issues of cloud computing such as resource management and security.
5. Evaluate and choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

Text Books:

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, ―Mastering Cloud Computing, Tata Mcgraw Hill, 2013.
2. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.

Reference Books:

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, ―Mastering Cloud Computing, Tata Mcgraw Hill, 2013.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing – A Practical Approach, Tata Mcgraw Hill, 2009.
3. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), O'Reilly, 2009.

Faculty Elective -II

SOTT3402a	**DESIGN PATTERNS**	**L T P C**
		3 0 0 3

Course Description:

The course addresses general principles and specific methods for design pattern and modular software subsystems. A notion of a design pattern is introduced as a well-known and tested solution to a recurring problem in a particular problem domain. In this course students will learn techniques to identify design problems and apply design patterns effectively to improve the quality of software.

Course Objectives:

1. Understand the concept of Design patterns and its importance.
2. Understand the behavioural knowledge of the problem and solutions.
3. Relate the Creational, Structural, behavioural Design patterns.
4. Apply the suitable design patterns to refine the basic design for given context.
5. Implement a module so that it executes efficiently and correctly.

UNIT I **10 Hrs**

Introduction: Design Pattern, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design
Pattern.

UNIT II **10 Hrs**

A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation.

UNIT III **8 Hrs**

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton.

UNIT IV **8 Hrs**

Structural Patterns: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy.

UNIT V **9 Hrs**

Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, Strategy, Template Method, Visitor. Conclusion: What to Expect from Design Patterns, The Pattern Community.

Course Outcomes:

On completion of the course, the student will be able to:

1. Identify the appropriate design patterns to solve object-oriented design problems.
2. Develop design solutions using creational patterns.
3. Apply structural patterns to solve design problems.
4. Construct design solutions by using behavioral patterns.

5. Design the software using Pattern Oriented Architectures.

Text Books:

1. Design Patterns by Erich Gamma, Pearson Education
2. Design Patterns Explained by Alan Shalloway, Pearson Education.

Reference Books:

1. Meta Patterns designed by Wolf gang, Pearson.
2. Head First Design Patterns by Eric Freeman-Oreilly.
3. JAVA Enterprise Design Patterns Vol-III By Mark Grand, Wiley DreamTech.
4. Patterns in JAVA Vol-I By Mark Grand, Wiley DreamTech.
5. Patterns in JAVA Vol-II By Mark Grand, Wiley DreamTech.

SOTT3402b	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. We 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 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 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 : Cybersecurity Threats, Vulnerabilities, Attacks and Protecting Secrets 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.

Course Outcomes:

1. Demonstrate various cyber threats and vulnerabilities, understanding their potential impact on digital assets.
2. Implement proactive measures to mitigate cyber threats and protect against common attack vectors.
3. Apply cryptographic techniques to ensure data integrity, authenticity, and confidentiality.
4. Develop incident response plans and disaster recovery strategies to minimize the impact of cybersecurity incidents.
5. Understand to ethical principles and professional responsibilities while making informed decisions in the realm of cybersecurity.

Text Books:

1. CISSP (ISC)2 Certified Information Systems Security Professional Official Study Guide, Mike Chapple, James Michael Stewart and Darril Gibson, 9th Edition
2. Cybersecurity: The Beginner's Guide, Dr. Erdal Ozkaya, Packt Publishing Limited, 2019.

Reference Books:

1. Cybersecurity Essentials, Charles J. Brooks, Christopher Grow, Philip Craig and Donald Short, 1st edition, Sybex.
2. Network Security Essentials, William Stallings, 6th edition, Pearson Education, 2018.

SOTT3402c **SOFTWARE PROJECT MANAGEMENT** **L T P C**

3 0 0 3

Prerequisites: A basic understanding of Software Engineering

Course Description: This course is aimed at introducing the primary important concepts of project management related to managing software development projects. They will also get familiar with the different activities involved in Software Project Management. Further, they will also come to know how to successfully plan and implement a software project management activity, and to complete a specific project in time with the available budget.

Course Objectives:

The course should enable the students to:

1. To understand the Software Project Planning and Evaluation techniques.
2. To plan and manage projects at each stage of the software development life cycle (SDLC).
3. To learn about activity planning and risk management principles.
4. To manage software projects and control software deliverables.
5. To develop skills to manage the various phases involved in project management and people management.

UNIT I **9 Hrs**

Project Evaluation and Project Planning: Importance of Software Project Management – Activities – Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

UNIT II **9 Hrs**

Project Life Cycle and Effort Estimation: Software process and Process Models – Choice of Process models – Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming– Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points – COCOMO II – a Parametric Productivity Model.

UNIT III **9 Hrs**

Activity Planning and Risk Management: Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning –Risk Management – – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical paths – Cost schedules.

UNIT IV **9 Hrs**

Project Management and Control: Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – Prioritizing

Monitoring – Project tracking – Change control – Software Configuration Management – Managing contracts – Contract Management.

UNIT V **9 Hrs**

Staffing in Software Projects: Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures – Dispersed and Virtual teams – Communications genres – Communication plans – Leadership.

Course Outcomes:

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

1. Understand the basic concepts, terminologies and issues of software project management.
2. Identify & analyze the different project contexts and suggest an appropriate management strategy.
3. Practice the role of professional ethics in successful software development.
4. Identify and describe the key phases of project management.
5. Determine an appropriate project management approach through an evaluation of the business context and scope of the project.

Text Books:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.
2. Software Project Management, by Walker Royce, Pearson Education

Reference Books:

1. Effective project management: Traditional, Agile, Extreme, Robert Wysocki, Sixth Edition, Wiley India, 2011.
2. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition, Tata Mc-Graw Hill,2006
3. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O'Reilly, 2006.

SOTT3402d **AGILE SOFTWARE DEVELOPMENT** **L T P C**
3 0 0 3

Course Description:

In this course, students will be introduced to the high-level aspects of agile planning, including product vision and roadmaps. Students will also learn how to manage requirements at the tactical level, including gathering, writing, and prioritizing requirements using agile techniques from each of the major frameworks.

Course Objectives:

1. To learn methodology and issues.
2. To learn the fundamental principles and practices associated with various agile development methods.
3. To learn how agile methods scale to large and distributed projects, including the role of systems engineering.
4. To understand the process of SCRUM in software development
5. To learn advance process of software implementation through various case studies

UNIT I **10 Hrs**

Introduction to Agile: Introduction to Agile Software Process Model - Agile Methodology & Principles – Types – Benefits - Life Cycle, Agile Project Management – Design and Construction - Agile Testing-Agile Tools. **Agile Processes:** Key Process Areas in CMM – Quality Improvement – Six Sigma : Six Sigma Overview, DMAIC - Define, Measure, Analyze, Improve, Control; DMADV -Define, Measure, Analyze, Design, Verify; Lean : Lean Overview, Lean Principles, Lean Rules, Lean Implementation - The 8 Forms of Waste; Lean Tools - 5 Why's, Pareto.

UNIT II **8 Hrs**

Agile Requirements: Meeting the requirements challenge iteratively-Requirements for Agile approach – Gathering & analysis –Behavior Driven Development (BDD) and Acceptance Test Driven Development (ATDD)- Designing storyboards and scrums in Agile approach.

UNIT III **9 Hrs**

Agile Methodologies: Pair Programming – Refactoring – Dynamic Systems Development (DSD) – Feature Driven Development (FDD) – Test Driven Development (TDD), Agile Unified Process – Agile Failure Models - Various reasons why agile fails?

UNIT IV **9 Hrs**

SCRUM: Scrum Foundations - Scrum Roles - Scrum Master - Product Owner – Team - Scrum Meetings - Scrum Artifacts - Product Backlog - Sprint Backlog - Burn-down Charts - Scaling Scrum – Manager in Scrum and Product Backlog.

UNIT V **9 Hrs**

Agile Planning and Estimation: Principles of Agile Metrics – Release, Planning and Estimation in Scrum.

Advanced Concepts and Case Studies: Scrum and Large Projects – Distributed Scrum – Agile Adoption - A case study of a scrum project, Scrum Success Stories.

Course Outcomes:
1. Understand of agile software engineering and its advantages
2. Understand software engineering standards for Agile process
3. To apply agile software engineering practices over the entire software development lifecycle.
4. Understand Scrum Framework and its application scenarios.
5. To understand Agile Metrics Release Planning and Estimation in Scrum based software development.

Text Books:
1. K.S. Rubin, Essential Scrum: A Practical Guide to the Most Popular Agile Process, Addison-Wesley, 2012.

Reference Books:
1. M. Cohn, Succeeding with Agile: Software Development Using Scrum, Addison-Wesley, 2009
2. S.W. Ambler, M. Lines, Disciplined Agile Delivery: A Practitioner's Guide to Agile Software Delivery in the Enterprise, IBM Press, 2012.
3. Chetankumar Patel, Muthu Ramachandran, Story Card Maturity Model (SMM): A Process Improvement Framework for Agile Requirements Engineering Practices, Journal of Software,Academy Publishers, Vol 4, No 5 (2009), 422-435, Jul 2009.
4. Kevin C. Desouza, Agile information systems: conceptualization, construction, and management,Butterworth-Heinemann, 2007
5. K. Beck, C. Andres, Extreme Programming Explained: Embrace Change, 2nd Edition, Addison-Wesley, 2004.

SOTT3402e **CLOUD COMPUTING** **L T P C**
3 0 0 3

Course Description:

This course covers topics such as cloud architecture, virtualization, security, and deployment models. Demystifies cloud infrastructure components, including virtual machines, networking, and storage. The students gain foundational knowledge of Hybrid, Multicloud, Microservices, Serverless, Application Modernization, and cloud security and monitoring.

Course Objectives:

The objective of this course is to make students to,

1. Understand the concept of cloud computing.
2. Appreciate the evolution of cloud from the existing technologies.
3. Gain knowledge on the architecture, the services and storage in cloud computing.
4. Familiarize with managing the resources and securing the cloud.
5. Appreciate the emergence of cloud as the next generation computing paradigm.

UNIT I **9 Hrs**

Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.

UNIT II **9 Hrs**

Cloud Enabling Technologies: Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish-Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices –Virtualization Support and Disaster Recovery.

UNIT III **9 Hrs**

Cloud Architecture, Services and Storage: Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds – laaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.

UNIT IV **9 Hrs**

Resource Management and Security in Cloud: Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.

UNIT V **9 Hrs**

Cloud Technologies and Advancements: Hadoop – Map Reduce – Virtual Box — Google App Engine – Programming Environment for Google App Engine — Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.

Course Outcomes:

On Completion of the course, the students should be able to:

1. Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
2. Learn the key and enabling technologies that help in the development of cloud.
3. Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
4. Explain the core issues of cloud computing such as resource management and security.
5. Evaluate and choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

Text Books:

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, ―Mastering Cloud Computing, Tata Mcgraw Hill, 2013.
2. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.

Reference Books:

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, ―Mastering Cloud Computing, Tata Mcgraw Hill, 2013.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing – A Practical Approach, Tata Mcgraw Hill, 2009.
3. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), O’Reilly, 2009.

SOTT3402f **MOBILE COMPUTING** **L T P C**

3 0 0 3

Course Description:

This course explores various challenges and opportunities of mobile computing, including topics such as wireless network protocols and standards, location awareness, sensing, user interfaces, application development, and security/privacy concerns.

Course Objectives:

The objective of this course is to make students to:

1. To learn about various wireless & cellular communication networks and various telephone and satellite networks.
2. To build knowledge on various Adhoc and sensor networks routing protocol
3. To gain knowledge of energy efficient protocol.
4. To build skills in working with Cognitive radio networks and recent telecommunication networks
5. To design and development of various network protocol using simulation tools.

UNIT I **9 Hrs**

Introduction: Overview of wireless and mobile infrastructure; Preliminary concepts on cellular architecture; Design objectives and performance issues; Radio resource management and interface; Propagation and path loss models; Channel interference and frequency reuse; Cell splitting; Channel assignment strategies; Overview of generations: - 1G to 5G

UNIT II **9 Hrs**

Location and handoff management: Introduction to location management (HLR and VLR); Mobility models characterizing individual node movement (Random walk, Fluid flow, Markovian, Activity-based)

UNIT III **9 Hrs**

Wireless transmission fundamentals: Introduction to narrow and wideband systems; Spread spectrum; Frequency hopping; Introduction to MIMO; MIMO Channel Capacity and diversity gain; Introduction to OFDM; MIMO-OFDM system; Multiple access control (FDMA, TDMA, CDMA, SDMA); Wireless local area network; Wireless personal area network (Bluetooth and zigbee).

UNIT IV **9 Hrs**

Mobile Ad-hoc networks: Characteristics and applications; Coverage and connectivity problems; Routing in MANETs.

UNIT V **9 Hrs**

Cognitive radio networks: Fixed and dynamic spectrum access; Direct and indirect spectrum sensing; Spectrum sharing; Interoperability and co-existence issues; Applications of cognitive radio networks.

Course Outcomes:

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

1. Understand the working principles of mobile networks and Contrast different types of telecommunication networks.
2. Study on location, handoff management and wireless fundamentals.
3. Study on MANET and Sensor networks including architecture, routing and power optimization technique.
4. Study on cognitive ratio networks and its applications.
5. Assess the recent telecommunication networks, resource management

Text Books:

1. Jochen Schiller, Mobile Communications. Pearson Education, 2009.
2. Andrea Goldsmith, Wireless Communications. Cambridge University Press, 2012.

Reference Books :

1. Ivan Stojmenovic, Handbook of Wireless Networking and Mobile Computing, Wiley, 2002.
2. Ezio Biglieri, Andrea J. Goldsmith, Larry J. Greenstein, Narayan Mandayam and H. Vincent Poor, Principles of Cognitive Radio. Cambridge University Press, 2012.
3. Shwetha, V., & Yashas, G. (2022). Extended reality: the future of mobile computing. International Research Journal of Modernization in Engineering Technology and Science, 4(7), 1521-1524.

SOTT3402g **IMAGE PROCESSING** **L T P C**
3 0 0 3

Course Description:
To learn and understand the fundamentals of digital image processing, and various image Transforms, Image Enhancement Techniques, Image restoration Techniques and methods, image compression and Segmentation used in digital image processing.

Course Objectives:
1. To study the image fundamentals and mathematical transforms necessary for image processing.
2. To study the image enhancement techniques.
3. To study image compression procedures.
4. To have an understanding of colour models, type of image representations and related statistics.
5. To study image segmentation and representation techniques.

UNIT I **9 Hrs**
Introduction: What is Digital Image Processing? The Origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System. **Digital Image Fundamentals:** Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships Between Pixels, Introduction to the Basic Mathematical Tools Used in Digital Image Processing.

UNIT II **9 Hrs**
Intensity Transformations and Spatial Filtering: Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing (Lowpass) Spatial Filters, Sharpening (Highpass) Spatial Filters, Highpass, Bandreject, and Bandpass Filters from Lowpass Filters, Combining Spatial Enhancement Methods. **Filtering in the Frequency Domain:** Sampling and the Fourier Transform of Sampled Functions, The Discrete Fourier Transform of One Variable, Extensions to Functions of Two Variables, Some Properties of the 2-D DFT and IDFT, The Basics of Filtering in the Frequency Domain, Image Smoothing Using Lowpass Frequency Domain Filters, Image Sharpening Using Highpass Filters, Selective Filtering, The Fast Fourier Transform.

UNIT III **9 Hrs**
Image Restoration and Reconstruction: A Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only—Spatial Filtering, Periodic Noise Reduction Using Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering, Geometric Mean Filter, Image Reconstruction from Projections.

UNIT IV **9 Hrs**

Colour Image Processing: Color Fundamentals, Color Models, Pseudocolor Image Processing, Basics of Full-Color Image Processing, Color Transformations, Color Image Smoothing and Sharpening, Using Color in Image Segmentation, Noise in Color Images, Color Image Compression.

UNIT V **9 Hrs**

Image Compression: Fundamentals, Models, Error free and lossy compression, Standards. **Morphological Image Processing:** Erosion and Dilation, Opening and Closing, The Hit-or-Miss Transform, Some Basic Morphological Algorithms, Morphological Reconstruction. Image segmentation.

Course Outcomes:

On successful completion of the course, the student will:

1. Be able to understand basic concepts image processing, image storage and types of transformations that can be applied to images.
2. Be able to compare the domains and methods of image processing.
3. Be able to learn and compare Image Enhancement and Restoration techniques.
4. Be able to learn and analyse colour image processing.
5. Familiar with morphological image processing.

Text Book:

1. Digital Image Processing, Fourth Edition, Global edition by Rafel C. Gonzalez and Richard E. Woods, Pearson Education.

Reference Books:

1. Digital Image Processing by Bhabatosh Chanda and Dwijesh Majumder, PHI.
2. Fundamentals of Digital Image Processing by Anil K Jain, PHI.
3. Digital Image Processing Using Matlab, Rafel C. Gonzalez and Richard E. Woods, Pearson Education.

SOTT3402h **DEEP LEARNING** **L T P C**
3 0 0 3

Prerequisite: Python Programming, Machine Learning

Course Description:

This course introduces students to the fascinating field of deep learning, which is a subset of machine learning focused on neural networks and their applications. Students will learn about neural network architectures, training techniques, and various deep learning applications, preparing them for real-world projects and research opportunities.

Course Objectives:

1. Understand the fundamentals of deep learning, including activation functions and Optimization Techniques.
2. Learn about the Neural Networks.
3. Learn and analysis the conventional neural networks.
4. Learn and analysis the recurrent neural networks.
5. Understand an image processing using DL algorithms

UNIT I Introduction to Deep Learning **9 Hrs**

Introduction to Deep Learning, Bayesian Learning, Decision Surfaces, Deep Feed, Forward Neural Networks, Gradient Descent, Back-Propagation and Other Differentiation Algorithms, Rectified Linear Unit (ReLU), Heuristics for Avoiding Bad Local Minima, Heuristics for Faster Training, Nestors Accelerated Gradient Descent, Regularization for Deep Learning, Optimization Techniques, Gradient Descent, Batch Optimization.

UNIT II Neural Network **9 Hrs**

Introduction to Neural Network, Multilayer Perceptron, Back Propagation Learning, Unsupervised Learning with Deep Network, Autoencoders.

UNIT III Convolutional Neural Networks **9 Hrs**

Convolutional Neural Network, building blocks of CNN, CNN Architectures, Convolution, Pooling Layers, Transfer Learning, Image Classification using Transfer Learning, Revisiting Gradient Descent, Momentum Optimizer, RMSProp, Adam. Case study: Develop a simple application for Classify the animals by using CNN approach.

UNIT IV Recurrent Neural Networks **9 Hrs**

Recurrent and Recursive Nets – Recurrent Neural Networks – Deep Recurrent Networks – Recursive Neural Networks – Applications, Case study: Develop a simple application for Classify the cancer by using RNN approach.

UNIT V Image Processing using DL **9 Hrs**

Classical Supervised Tasks with Deep Learning, Image Denoising, Semantic Segmentation, Object Detection, LSTM Networks, Generative Modelling with DL, Case Study: Implement of any one deep learning algorithm with TensorFlow and Keras tools.

Course Outcomes:

1. Understand the role of deep learning in machine learning applications.
2. Demonstrate the neural networks.
3. Design and implement convolutional neural networks.
4. Design and implement recurrent neural networks.
5. Demonstrate and Analysis the image processing in deep learning.

Text Books:

1. Deep Learning- Ian Goodfelllow, Yoshua Benjio, Aaron Courville, The MIT Press, 2017
2. Pattern Classification, Richard O. Duda, Peter E. Hart, David G. Stork, John Wiley & Sons Inc.

Reference Books:

1. Deep Learning for Computer Vision, Rajalingappaa Shanmugamani, Packt Publishing, 2018.
2. Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence, Phil Kim, Apress, 2017.
3. Convolutional Neural Networks in Visual Computing, Ragav Venkatesan, Baoxin Li, CRC Press, 2018.
4. Neural Network for Beginners: Build Deep Neural Networks and Develop Strong Fundamentals using Python's NumPy, and Matplotlib, Sebastian Klaas, BPB Publications, 2021.

SOTT3402i	E-COMMERCE	L T P C
		3 0 0 3

Course Description:

This course provides an introduction to information systems for business and management. It is designed to familiarize students with organizational and managerial foundations of systems, the technical foundation for understanding information systems.

Course Objectives:

1. Understand the basics of E-Commerce, its models, applications and IT Act.
2. Illustrate the fundamentals of internet technology, and web page creation in HTML.
3. Evaluate the tools and security involved in e-payment methods.
4. Differentiate various frauds involved in E-Commerce.
5. Familiarize with the applications of EC in functional areas of management.

UNIT I **9 Hrs**

Introduction: Concept of E-Commerce– Features– Driving forces - Benefits and limitations – Applications of E-commerce; B2B and B2C models of E-commerce – E-Commerce vs. E-Business - Future of E-commerce.

UNIT II **9 Hrs**

Internet Technology: Internet infrastructure - Internet vs. intranet vs. extranet – Firewalls - Internet protocols TCP/IP, HTTP, SMTP, FTP - Utility programs Telnet, Finger, Ping, Tracer-WWW – Internet features and services - Portal vs. Website vs. Communities - HTML and web design - Block chain technology.

UNIT III **9 Hrs**

E-Payments: Types of e-payments - SET and SSL protocols; EDIFACT, EDI; Process of credit card payment - Third Party Processors – Bit coin.

UNIT IV **9 Hrs**

Issues in E-Commerce: Social issues - Legal issues – Privacy issues - Ethical issues – IPR issues; Regulatory framework of E-Commerce under Indian Information Technology Act 2000.

UNIT V **9 Hrs**

E-Commerce Applications: Advertising – Supply chain management – Marketing research – Financial services – Publishing – Entertainment - Retailing – Trading stocks – Role of ERP Solutions in E-Commerce.

Course Outcomes:

1. Understand the fundamentals of EC, its applications, and models, and the provisions of IT ACT on EC.
2. Comprehend the internet technology, its protocols, and acquire skills in designing a web page through HTML.

3. Realize the theoretical base on the protocols and cryptography involved in E-payments, and methodology involved in the use of e-payment tools.
4. Critically examine the frauds and piracies involved in EC, including legal, privacy, ethical and IPR issues.
5. Apply the EC technology in advertising, supply chain, marketing research, financial services, publishing, entertainment, retailing and stock market trading.

Text Books:

1. Kenneth C. Laudon, Carol Guercio Traver: E-commerce, 13/e, 2017, Pearson Education India.
2. Michael Chung, Jae Lee, David King, Efraim Turban: E-Commerce – A Managerial Perspective, Pearson Education India.

Reference Books:

1. David Whiteley: E-Commerce- Strategy technologies and Applications, Tata McGraw Hill.
2. Kamalesh Bajaj, Debjani Nag: E-Commerce, the Cutting Edge of Business- Tata McGraw Hill.

SOTT3402j **BLOCKCHAIN TECHNOLOGY** **L T P C**

3 0 0 3

Course Description:

This course provides an in-depth understanding of blockchain technology, its architecture, and its applications. Students will explore the fundamentals of blockchain, including decentralized networks, cryptographic principles, consensus algorithms, and smart contracts. The course covers various blockchain platforms, their use cases across different industries, and the challenges and future trends in blockchain technology. Emphasis is placed on theoretical knowledge and the analysis of real-world applications and case studies to provide students with a comprehensive understanding of blockchain technology and its potential impact.

Course Objectives:

The students will try to learn:

1. To learn the foundational concepts of blockchain and cryptographic primitives.
2. To analyse different blockchain architectures and their categories.
3. To understand emerging cryptocurrencies and consensus mechanisms.
4. To explore advanced blockchain protocols and zero-knowledge proofs.
5. To apply blockchain technology in areas beyond cryptocurrencies, such as cybersecurity and micropayments.

UNIT I Introduction to Blockchain and Crypto primitives **9 Hrs**

Blockchain, Distributed Ledgers - Cryptographic basics for cryptocurrency - Hashing, signature schemes, encryption schemes and elliptic curve cryptography - CAP theorem and blockchain - Categories of Blockchains: Public, Private blockchains, Permissioned Ledger, Tokenized blockchains, Tokenless blockchains, Sidechains. Hardware and software requirements of Block chain

UNIT II Emerging Cryptocurrencies **9 Hrs**

Distributed identity: Public and private keys, Digital identification and wallets; Decentralized network - Distributed ledger: Permissioning framework, Blockchain data structure - Double spending; Network consensus -Sybil attacks, Block rewards and miners, Difficulty under competition, Forks and consensus chain, The 51% attack, Confirmations and finality - Proof of Work (PoW), Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS) .

UNIT III Zero Knowledge proofs and protocols in Blockchain **9 Hrs**

Pseudo-anonymity vs. anonymity: Zero Knowledge proofs and protocols in Blockchain - Succinct non interactive argument for Knowledge (SNARK) - pairing on Elliptic curves – Zcash.

UNIT IV Building Cryptocurrency and Smart Contracts **9 Hrs**

Link between Blockchain and Cryptocurrencies, Mechanics of Bitcoin: Bitcoin transactions, Bitcoin Scripts. Ethereum - Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Solidity –Smart Contracts – some attacks on smart contracts.

UNIT V Beyond Crptocurrency **9 Hrs**

Applications of Blockchain in cybersecurity, Smart property, Efficient micropayments, Coupling Transactions and Payment(Interdependent Transactions), Escrow transactions, Auctions and Markets.

Course Outcomes:

After Completion of the course the student will be able to

1. Understand the necessary cryptographic background
2. Familiarize the mechanism of Blockchain and Cryptocurrency
3. Analyze the protocols used in Blockchain technology
4. Examine the major developments related to blockchain and cryptocurrencies.
5. Identify the applicability of blockchains beyond cryptocurrency.

Textbooks:

1. Treccani, A., Lipton, A. (2021). Blockchain And Distributed Ledgers: Mathematics, Technology, And Economics - First Edition, Singapore: World Scientific Publishing.

2. Bashir, I. (2020). Mastering Blockchain: A Deep Dive Into Distributed Ledgers, Consensus Protocols, Smart Contracts, DApps, Cryptocurrencies, Ethereum, and More - Third Edition, United Kingdom: Packt Publishing.

References Books:

1. Goldfeder, S., Bonneau, J., Miller, A., Felten, E., Narayanan, A. (2016). Bitcoin and Cryptocurrency Technologies - First Edition, Princeton University Press.

2. Wattenhofer, R. (2019). Blockchain Science: Distributed Ledger Technology – Third Edition, United States: Independently Published.

SOTT3402k MATHEMATICAL FOUNDATIONS OF DATA SCIENCE L T P C
3 0 0 3

Course Description:

This course provides a study of various Mathematical Methods and Statistical Methods which is needed for Artificial Intelligence, Machine Learning, and Data Science and also for Computer Science and engineering problems. This course will be rigorous, and will explore the rich and fascinating math behind some of the popular techniques and intellectual ideas of modern-day data science and machine learning.

Course Objectives:

1. To employ methods related to these concepts in a variety of data science applications.
2. To adopt a rigorous and mathematical approach to solving problems in machine learning and data science.
3. To apply the mathematical concepts discussed over the duration of the course.
4. To apply the concepts of probability and distributions to some case studies.
5. To Correlate results to the solution approach followed (Analysis).

UNIT I 9 Hrs

Data Representation: Distance measures, Projections, Notion of hyper planes, half-planes. Principal Component Analysis- Population Principal Components, sample principal coefficients, covariance, matrix of data set, Dimensionality reduction, Singular value decomposition, Gram Schmidt process.

UNIT II 9 Hrs

Single Variable Distribution: Random variables (discrete and continuous), probability density functions, properties, Mathematical Expectation - Probability distribution - Binomial, Poisson approximation to the binomial distribution and normal distribution their properties-Uniform distribution-exponential distribution.

UNIT III 9 Hrs

Stochastic Processes and Markov Chains: Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, step transition probabilities, Markov chain, Steady state condition, Markov analysis.

UNIT IV 9 Hrs

Multivariate Distribution Theory: Multivariate Normal distribution – Properties, Distributions of linear combinations, independence, marginal distributions, conditional distributions, Partial and Multiple correlation coefficient. Moment generating function. **Bayesian Inference and its Applications**: Statistical tests and Bayesian model comparison, Bit, Surprisal, Entropy, Source coding theorem, Joint entropy, Conditional entropy, Kullback-Leibler divergence.

UNIT V **9 Hrs**

Optimization: Unconstrained optimization, Necessary and sufficiency conditions for optima, Gradient descent methods, Constrained optimization, KKT conditions, Introduction to non-gradient techniques, Introduction to least squares optimization, Optimization view of machine learning. Data Science Methods: Linear regression as an exemplar function approximation problem, linear classification problems.

Course Outcomes:

After completion of the course, students will be able to

1. Apply logical thinking to problem-solving in context.
2. Employ methods related to these concepts in a variety of data science applications.
3. Use appropriate technology to aid problem-solving and data analysis.
4. The Bayesian process of inference in probabilistic reasoning system.
5. Demonstrate skills in unconstrained optimization.

Text Books:

1. Mathematics for Machine Learning by A. Aldo Faisal, Cheng Soon Ong, and Marc Peter Deisenroth.
2. Dr. B.S Grewal, Higher Engineering Mathematics, 45th Edition, Khanna Publishers.
3. S. D. Sharma, Operations Research, Kedarnath and Ramnath Publishers, Meerut, Delhi.

Reference Books:

1. Operations Research, An Introduction, Hamdy A. Taha, Pearson publishers.
2. A Probabilistic Theory of Pattern Recognition by Luc Devroye, Laszlo Gyorfi, Gabor Lugosi.
3. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications.

SOTT3402l TRANSFORMS AND BOUNDARY VALUE PROBLEMS L T P C
3 0 0 3

Course Description:

This course aims at providing the student to acquire the knowledge on the partial differential equations and transforms. The student develops the idea of analytical ability in solving boundary value problems and transform techniques.

Course Objectives:

The course should enable the students to:

1. Enlighten the learners in the concept of partial differential equations.
2. Furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.
3. To have thorough knowledge in Fourier series.
4. Gain good knowledge in the application of Fourier Transforms.
5. Learn about Z- transforms and its applications.

UNIT I 9 Hrs

Partial Differential Equations: Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of first order PDEs by Lagrange's method- Solution of non-linear PDEs (Standard forms).

UNIT II 9 Hrs

Applications of Partial Differential Equations: Solution of second order PDEs by Method of separation of variables – Solutions of one-dimensional wave equation, one dimensional heat equation under initial and boundary conditions.

UNIT III 9 Hrs

Fourier Series: Determination of Fourier coefficients (Euler's) – Dirichlet conditions for the existence of Fourier series -Fourier series of Even and odd functions – Half-range Fourier sine and cosine expansions.

UNIT IV 9 Hrs

Fourier Transforms: Fourier integral theorem (only statement) – Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.

UNIT V 9 Hrs

Z-Transforms: z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms.

Course Outcomes:

After completion of the course, students will be able to

1. Formulate/solve/classify the solutions of Partial differential equations.

2. Find the solution of one-dimensional wave equation and heat equation.
3. Evaluate the Fourier series expansion of periodic functions.
4. Understand the usage of Fourier Transforms.
5. Apply z-transforms to solve difference equations.

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, "Higher engineering mathematics", Khanna publishers, New edition.

Reference Books:

1. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
2. Sankara Rao, "Introduction to Partial Differential Equations", 2nd Edition, PHI Learning Pvt. Ltd., 2006.
3. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.

SOTT3402m **OPTIMIZATION TECHNIQUES** **L T P C**
3 0 0 3

Course Description:

This course introduces different mathematical concepts in optimization techniques. The objective of the course is to provide the basic tools of operations research in solving the engineering problems through optimization techniques their basic concepts, principles, linear programming and queuing theory. This course studies with strong math background to improve Strong analytics skills that needed.

Course Objectives:

The course should enable the students to:

1. To impart the basic concepts of modelling, models and statements of the operations research.
2. Formulate and solve linear programming problem/situations.
3. To solve transportation problems to minimize cost.
4. Describe various methods to find an optimal sequence of jobs to reduce makespan.
5. Apply Queuing theory to solve problems of traffic congestion, birth and death process, etc.

UNIT I **9 Hrs**

Introduction to Operations Research: OR definition - Classification of Models, modeling – Methods of solving OR Models, limitations and applications of OR models.

UNIT II **9 Hrs**

Linear programming problems (LPP): Problem Formulation-Graphical method-Simplex method-Big M Method-Dual simplex method.

UNIT III **9 Hrs**

Transportation Problem: Formulation of transportation problem, types, initial basic feasible solution using North-West Corner rule, Vogel's Approximation method, Optimality in Transportation problem by Modified Distribution (MODI) method.

UNIT IV **9 Hrs**

Sequencing: Job sequencing, Johnsons Algorithm for n Jobs and Two machines, n Jobs and Three Machines, n jobs through m machines, Two jobs and m Machines Problems.

UNIT V **9 Hrs**

Queuing Theory: Introduction, Terminology, Pure Birth and Death process, M/M/1 and M/M/S model and simple problems.

Course Outcomes:

After completion of the course, students will be able to

1. Develop mathematical models for practical problems.
2. Apply linear programming to transportation problems.

3. Formulate practical problems given in words into a mathematical model.
4. Understand an optimal solution in assignment jobs, give transportation of items from sources to destinations.
5. Able to analyse the Queuing theory problems and draw appropriate inferences.

Text Books:

1. Sharma S.D., Operations Research: Theory, Methods and Applications, 15th Edition, Kedar Nath Ram Nath, 2010.
2. Rao S.S, “Optimization – Theory and applications”, Wiley Easter Ltd., 1979.

Reference Books:

1. David G. Luerbeggan, “Introduction to Linear and Non-Linear Programming”, Addison Wesley Publishing Co. 1973.
2. Cordan C.C. Beveridge and Robert S. Schedther, “Optimization, Theory and Practice” McGraw Hill Co.1970.
3. Hamdy A. Taha, Operations Research, An Introduction, Pearson publishers.

SOTT3402n **INFORMATION SECURITY** **L T P C**
3 0 0 3

Course Description:

This course offers complete coverage of all aspects of computer security, including users, software, devices, operating systems, database, networks and privacy issues. Reflecting rapidly evolving attacks and countermeasures, it introduces up-to-the-minute best practices for authenticating users, preventing malicious code execution, using encryption, protecting privacy, implementing firewalls, detecting intrusions and more.

Course Objectives:

1. To learn various threats and attacks in a network.
2. To understand and explore fundamental techniques in developing secure applications.
3. To analyze various authentication and access control mechanisms.
4. To learn various methodologies for securing information systems ranging from operating systems to database management systems and to applications.
5. To understand various privacy issues and policies

UNIT I **9 Hrs**

Information Security Concepts: Information Security - Computer Security - Threats - Harm - Vulnerabilities - Program Security - Malicious code - Malwares: Viruses, Trojan Horses and Worms - Counter measures. **Authentication and Access Control:** Authentication - Key management schemes - Hierarchical Key Management Techniques -Security Standards - User Authentication Protocols - Implementing Access Controls - Access Control Models - Role Based Access Control - Attribute Based Access Control - Attribute based Encryption in Information Storage - Physical Access Controls.

UNIT II **9 Hrs**

Operating Systems Security: Security in Operating System - Security in the design of OS: Simplified Design, Layered Design, Kernelized design, Reference Monitor, Trusted Systems, Trusted Systems Functions - Trusted Operating System Design - Rootkit.

UNIT III **9 Hrs**

Security Countermeasures: Design of Firewalls - Types - Personal Firewalls - Configurations - Network Address Translation - Data Loss Prevention - Intrusion Detection and Prevention Systems: Types of IDSs, Intrusion Prevention system, Intrusion Response, Goals of IDSs, Strength and Limitations.

UNIT IV **9 Hrs**

Database Security: Database Security - Database Security Requirements - Reliability and Integrity - Sensitive Data - Types of Disclosures - Preventing Disclosures - Inference - Multilevel Databases - Multilevel Security - Database Attacks - SQL Injection Attacks.

Web Security: Browser Attacks: Types, Failed Identification and Authentication - Misleading and Malicious Web Contents - Protection against Malicious Web Pages - Website Data: Code within Data, Cross Site Scripting Attacks - Prevention of Data Attacks - Fake e-mails - Spam Detection - Phishing Attacks - Phishing URL Detection and Prevention.

UNIT V **9 Hrs**

Privacy Issues: Privacy Concepts: Aspects of Information Privacy, Computer-Related Privacy Problems -Threats to Personal Data Privacy - People-Based Privacy Concerns - Privacy Principles and Policies - Individual Actions to Protect Privacy - Governments and Privacy - Identify Theft - Privacy issues on the Web Data - Application of Cryptographic Techniques for Privacy Preservation.

Course Outcomes:

1. Apply fundamental knowledge on key security concepts, access control and authentication.
2. Comprehend the use of security techniques for securing the information.
3. Differentiate the needs and application of security in Operating System and Firewalls.
4. Apply various data privacy policies in different areas of web based security systems.
5. Analyze various privacy principles and policies.

Text Book:

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies, Security in Computing, 2018, Fifth Edition, Pearson, New York.

Reference Books:

1. Mark Stamp, Information Security: Principles and Practice, 2021, 3rd Edition, Wiley.
2. Joanna Lyn Grama, Legal and Privacy Issues in Information Security, 2020, 3rd Edition, Jones and Bartlett Publishers, Inc.

SOTT3402o **ETHICAL HACKING** **L T P C**

3 0 0 3

Course Description :

Ethical Hacking is one of the most popular courses with the increase in people's interest in internet security and ways for keeping one's personal security safe and secure from different peoples. This course cover tools and techniques that are used by hackers and penetration testers and topics in general namely Ethical Hacking, Website, System Hacking & Security and Mobile & Wireless Security.

Course Objectives:

The objective of this course is to make students to,

1. To learn about the importance of information security.
2. To learn different scanning and enumeration methodologies and tools.
3. To understand various hacking techniques and attacks.
4. To be exposed to programming languages for security professionals.
5. To get familiarized with the different phases in penetration testing.

UNIT I **9 Hrs**

Introduction to Hacking: Introduction to Hacking – Importance of Security – Elements of Security – Phases of an Attack – Types of Hacker Attacks – Hacktivism – Vulnerability Research – Introduction to Footprinting – Information Gathering Methodology – Footprinting Tools – WHOIS Tools – DNS Information Tools – Locating the Network Range – Meta Search Engines.

UNIT II **9 Hrs**

Scanning and Enumeration: Introduction to Scanning – Objectives – Scanning Methodology – Tools – Introduction to Enumeration – Enumeration Techniques – Enumeration Procedure – Tools.

UNIT III **9 Hrs**

System Hacking: Introduction – Cracking Passwords – Password Cracking Websites – Password Guessing – Password Cracking Tools – Password Cracking Counter measures – Escalating Privileges –Executing Applications –Keyloggers and Spyware.

UNIT IV **9 Hrs**

Programming for Security Professionals: Programming Fundamentals – C language – HTML – Perl – Windows OS Vulnerabilities – Tools for Identifying Vulnerabilities – Countermeasures – Linux OS Vulnerabilities – Tools for Identifying Vulnerabilities – Countermeasures.

UNIT V **9 Hrs**

Penetration Testing: Introduction – Security Assessments – Types of Penetration Testing- Phases of Penetration Testing – Tools – Choosing Different Types of Pen-Test Tools – Penetration Testing Tools.

Course Outcomes:

Upon completion of this course, the student should be able to,

1. Understand how to secure the information.
2. Defend hacking attacks and protect data assets.
3. Defend a computer against a variety of security attacks using various tools.
4. Practice and use safe techniques on the World Wide Web.
5. Get familiarized with the different phases in penetration testing.

Text Books:

1. Ec-Council, “Ethical Hacking and Countermeasures: Attack Phases”, Delmar Cengage Learning,2009.
2. Michael T. Simpson, Kent Backman, James E. Corley, “Hands-On Ethical Hacking and Network Defense”, Cengage Learning, 2012.

Reference Books:

1. Patrick Engebretson, “The Basics of Hacking and Penetration Testing – Ethical Hacking and Penetration Testing Made Easy”, Syngress Media, Second Revised Edition, 2013.
2. Jon Erickson, “Hacking: The Art of Exploitation”, No Starch Press, Second Edition, 2008.
3. Daniel G. Graham, Ethical Hacking: A Hands-on Introduction to Breaking In, William Pollock, 2021.

SOTT3402p **INTERNET OF THINGS** **L T P C**
3 0 0 3

Course Description:
Internet of Things is a course that deals with the study of how devices are connected and how it helps to stay connected over the Internet. The course teaches individuals how the Internet of Things is helpful in our daily lives and how to stay connected over the Internet.

Course Objectives:
The objective of this course is to make students to:
1. To impart knowledge on the infrastructure, sensor technologies
2. To gain knowledge of networking technologies of Internet of Things.
3. To analyse, design and develop solutions for Internet of Things.
4. To explore the real-life aspects of Internet of Things.
5. To provide exposure to the IoT data processing and storage

UNIT I **9 Hrs**
IoT Fundamentals: Definition and Characteristics of Internet of Things (IoT) - Challenges and Issues - Physical Design of IoT - Logical Design of IoT - IoT Functional Blocks.
IoT Communication Architectures and Protocols : Control Units – Communication modules – Bluetooth – Zigbee – WiFi – GPS - IoT Protocols (IPv6, 6LoWPAN, RPL, CoAP) – MQTT - Wired Communication - Power Sources.

UNIT II **9 Hrs**
Technologies Behind IoT : Four pillars of IoT paradigm: RFID, Wireless Sensor Networks, Supervisory Control and Data Acquisition (SCADA) - M2M - IoT Enabling Technologies: Bigdata Analytics, Cloud Computing, Embedded Systems

UNIT III **9 Hrs**
Resource Management in IoT: Network Configuration Protocol, Open vSwitch Database Management Protocol - Routing and Protocols: Collection Tree, LOADng.

UNIT IV **9 Hrs**
IoT to Web of Things: Scope of Web of Things (WoT) – IoT Data Management: Set up cloud environment, Cloud access from sensors, Data Analytics Platforms for IOT- Resource Identification: Richardson Maturity Model - REST API.

UNIT V **9 Hrs**
IoT Data Processing and Storage: Time Series Data and their characteristics, time series databases, basic time series analytics, data summarization and sketching, dealing with noisy and missing data, anomaly and outlier detection.

Course Outcomes:
After completion of the course, the student will be able to:
1. Understand the fundamentals of IoT, its applications.

2. Understand and analyze various tools for design of IoT system.
3. Analyze the Raspberry Pi tool and its features.
4. Deploy an IoT application and connect to the cloud.
5. Build smart devices using IoT

Text Books:

1. Samuel Greengard, The Internet of Things, MIT Press Essential Knowledge Series, 2015
2. Sharma, L., & Carpenter, M. (Eds.). (2022). Computer Vision and Internet of Things: Technologies and Applications. CRC Press.

Reference Books:

1. Ben Fry, Visualizing Data-Exploring and Explaining Data with the Processing Environment, O'Reilly Media, 2008.
2. Andrew K Dennis, Raspberry Pi Computer Architecture Essentials, Packt Publishing, 2016
3. Mangla, M., Kumar, A., Mehta, V., Bhushan, M., & Mohanty, S. N. (Eds.). (2022). Real-life applications of the Internet of Things: Challenges, applications, and advances.

SOTT3402q	EMBEDDED SYSTEMS	L T P C
		3 0 0 3

Course Description:
This course emphasizes on comprehensive treatment of embedded hardware and real time operating systems along with case studies, in tune with the requirements of Industry. The objective of this course is to enable the students to understand embedded-system programming and apply that knowledge to design and develop embedded solutions.

Course Objectives:
1. To understand the architecture of embedded processors, microcontrollers and Peripheral devices
2. To learn programming the embedded processor in assembly
3. To understand the challenges in developing operating systems for embedded systems
4. To learn programming the embedded systems in high level language such as C
5. To understand the Real time operating systems

UNIT I **9 Hrs**
Introduction To Embedded System: Components of Embedded System – Classification - Characteristic of embedded system Microprocessors & Micro controllers- Introduction to embedded processors - Embedded software architectures: Simple control loop - Interrupt controlled system - Cooperative multitasking - Preemptive multitasking or multi-threading - Micro kernels and kernels - Monolithic kernels - Exotic custom operating systems.

UNIT II **9 Hrs**
Embedded Hardware Architecture: ARM 2 TDMI core based 32 Bit microcontrollers and family of processors, Register, Memory and Data transfer, Arithmetic and Logic instructions, Assembly Language, I/O operations interrupt structure, ARM cache. ARM Bus, Embedded systems with ARM.

UNIT III **9 Hrs**
Real Time Operating Systems: Tasking Models, Task States, Services and Transitions - Real-Time Scheduling Algorithms: Round-Robin, FIFO, Priority-Based Preemptive Scheduling - Rate-Monotonic Scheduling - Priority Inversion and Priority Ceiling - Deadlocks - Process Synchronization – IPC - Shared Memory, Memory Locking, Memory Allocation - Signals – Semaphore Flag or mutex as Resource key – Message Queues – Mailboxes – Pipes – Virtual Sockets.

UNIT IV **9 Hrs**
Software Development: Embedded Programming in C and C++ - Source Code Engineering Tools for Embedded C/C++ - Program Modeling Concepts in Single and Multiprocessor Systems - Software Development Process - Software Engineering Practices in the Embedded Software Development – Hardware / Software Co-design in an Embedded System

UNIT V **9 Hrs**

Study of Micro C/OS-II: RTOS System Level Functions – Task Service Functions Time Delay Functions – Memory Allocation Related Functions – Semaphore Related Functions Mailbox Related Functions – Queue Related Functions – Case Studies of Programming with RTOS.

Course Outcomes:

1. Understand the embedded systems
2. Learn the embedded systems Architecture
3. Understand the embedded systems programming
4. Learn about the real time operating systems
5. Understand the concept on micro C

Text Books:

1. Rajkamal, "Embedded System: Architecture, Programming and Design" Tata McGraw-Hill, 2003.
2. Wayne Wolf, "Computers as Components – Principles of Embedded Computing System Design", Harcourt India Pvt. Ltd., Morgan Kaufmann Publishers, First Indian Reprint, 2001.

Reference Books:

1. Steve Heath, "Embedded Systems Design", Newnes, Second edition, 2003.
2. Noergaard, "Embedded System Architecture", Elsevier India Private Limited, 2005
3. Sriram Iyer and Pankaj Gupta, "Embedded Real-Time Systems Programming", Tata McGraw-Hill, 2004

SOTT3402r **GREEN COMPUTING** **L T P C**

3 0 0 3

Course Description:

Green computing (also known as green IT or sustainable IT) is the design, manufacture, use and disposal of computers, chips, other technology components and peripherals in a way that limits the harmful impact on the environment, including reducing carbon emissions and the energy consumed by manufacturers data centers end-users. Green computing also encompasses choosing sustainably sourced raw materials, reducing electronic waste and promoting sustainability through the use of renewable resources.

Course Objectives:

The objective of this course is to make students to:

1. To learn the fundamentals of Green Computing.
2. To analyze the Green computing Grid Framework.
3. To explore and analyze optimization issues
4. To understand the issues related with Green compliance.
5. To study and develop various case studies.

UNIT I **9 Hrs**

Fundamentals: Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.

UNIT II **9 Hrs**

Green assets and modelling: Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models.

UNIT III **9 Hrs**

Grid framework: Virtualization of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework.

UNIT IV **9 Hrs**

Green Compliance: Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.

UNIT V **9 Hrs**

Case study: The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

Course Outcomes:

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

1. Acquire knowledge to adopt green computing practices to minimize negative impacts on the environment.
2. Enhance the skill in energy saving practices in their use of hardware.
3. Able to apply optimization in various fields
4. Evaluate technology tools that can reduce paper waste and carbon footprint by the stakeholders.
5. Understand the ways to minimize equipment disposal requirements.

Text Books:

1. Bhuvan Unhelkar, ―Green IT Strategies and Applications-Using Environmental Intelligence‖, CRC Press, June 2014.
2. Woody Leonhard, Katherine Murray, ―Green Home computing for dummies‖, August 2012.

Reference Books:

1. Alin Gales, Michael Schaefer, Mike Ebbers, ―Green Data Center: steps for the Journey‖, Shroff/IBM rebook, 2011.
2. John Lamb, ―The Greening of IT‖, Pearson Education, 2009.
3. Jason Harris, ―Green Computing and Green IT- Best Practices on regulations & industry‖, Lulu.com, 2008
4. Carl speshocky, ―Empowering Green Initiatives with IT‖, John Wiley & Sons, 2010.
5. Wu Chun Feng (editor), ―Green computing: Large Scale energy efficiency‖, CRC Press

SOTT3402s	CLOUD SECURITY	L T P C
		3 0 0 3

Prerequisite: Cloud Computing, Network Security

Course Description:

This course provides a comprehensive exploration of cloud security, encompassing architecture, infrastructure, data, applications, and operations in cloud computing environments. We will gain proficiency in managing cloud security, mitigating risks, and ensuring resource integrity and availability and also equipped to safeguard cloud assets and conduct secure operations within a cloud-driven landscape.

Course Objectives:

1. Understand Cloud Security Fundamentals and shared responsibilities between cloud providers and customers.
2. Learn strategies for securing data in cloud storage, encryption techniques for different service models, and effective management of encryption keys.
3. Implement Application Security and Explore secure software development lifecycles, testing methods for cloud applications and integration of DevOps.
4. Gain insights into cloud provider selection, incident response protocols, and the fundamentals of Security as a Service (SECaaS).
5. Understand the importance of governance, risk management, legal considerations, and compliance in cloud environments.

UNIT I **9 Hrs**

Cloud Architecture and Infrastructure Security for Cloud: Introduction to Cloud Computing, Introduction & Cloud Architecture, Cloud Essential Characteristics, Cloud Service Models, Cloud Deployment Models, Shared Responsibilities, Intro to Infrastructure Security for Cloud Computing, Software Defined Networks, Cloud Network Security, Securing Compute Workloads, Management Plane Security, Disaster Recovery (BCDR).

UNIT II **9 Hrs**

Managing Cloud Security and Risk: Introduction, Governance, Managing Cloud Security Risk, Compliance, Legal Issues in Cloud, Audit, CSA Tools.

UNIT III **9 Hrs**

Data Security for Cloud Computing: Introduction, Cloud Data Storage, Securing Data in the Cloud, Encryption For IaaS, Encryption For PaaS & SaaS, Encryption Key Management, Other Data Security Options, Data Security Lifecycle

UNIT IV **9 Hrs**

Application Security and Management for Cloud Computing: Introduction, Secure Software Development Life Cycle (SSDLC), Testing & Assessment, DevOps, Secure Operations, Identity & Access Management Definitions, IAM Standards.

UNIT V **9 Hrs**

Cloud Security Operations: Introduction, Selecting A Cloud Provider, Incident Response, SECaaS Fundamentals, SECaaS Categories & Recommendations.

Course Outcomes:

1. Understand fundamental concepts of cloud computing, including architecture, essential characteristics, service models, and deployment models.
2. Implement data security strategies in cloud environments, including securing data storage, encryption, and key management.
3. Apply secure software development practices, testing, and DevOps integration to ensure application security in the cloud.
4. Analyse and Implement cloud security operations effectively, including selecting a cloud provider, incident response, and utilizing Security as a Service solutions.
5. Demonstrate an understanding of governance, risk management, legal considerations, and compliance requirements specific to cloud computing.

Text Books:

1. CCSP Certified Cloud Security Professional Official Study Guide, Ben Malisow, Dan Meuller, Brandon Carroll, Sybex.
2. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly Media, 2009.

Reference Books:

1. Cloud Computing: Concepts, Technology & Architecture, Thomas Erl, Ricardo Puttini, Zaigham Mahmood, Prentice Hall, 1st edition, 2013.
2. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley, 1st edition, 2010.

SOTT3402t	**DEVNET**	**L T P C**
		3 0 0 3

Prerequisite: Advanced Computer Networks

Course Description:

The course emphasizes essential network fundamentals, including networking protocols and devices, and explores application deployment and security. Through hands-on experiences, learners will delve into DevNet developer environments, software design, and API integration. With a focus on infrastructure automation, we will master scripting, tools, and concepts to manage network programmability, device models, and security platforms and also, we will be equipped with the skills to thrive in the dynamic world of DevNet development and network automation.

Course Objectives:

1. Understand the DevNet environment, online resources, and principles of software design.
2. Explore different API design and architecture styles.
3. Develop a foundational understanding of network principles, from network interface to internetwork layers.
4. Understand network considerations for application development and delve into securing applications.
5. Acquire skills in basic scripting, automation tools, Infrastructure as Code (IaC), testing automation, and network simulation. Understand the fundamental differences between blockchain, distributed ledger technology, and distributed databases.

UNIT I **9 Hrs**

DevNet Developer Environment and Software Development and Design: DevNet Overview, Exploring DevNet Online Resources, Software Development and Design, Version Control, Coding Basics, Code Review and Testing, Understanding Data Formats.

UNIT II **9 Hrs**

Application Programming Interfaces (APIs): Introducing APIs, API Design Styles, API Architecture Styles, Introduction to REST APIs, authenticating to a REST API, API Rate Limits, Working with Webhooks, Troubleshooting API Calls.

UNIT III **9 Hrs**

Network Fundamentals: Introduction to Network Fundamentals, Network Interface Layer, Internetwork Layer, Network Devices, Networking Protocols, Troubleshooting Application Connectivity Issues.

UNIT IV **9 Hrs**

Application Deployment and Security: Understanding Deployment Choices with Different Models, Creating and Deploying a Sample Application, Continuous Integration/Continuous Deployment (CI/CD), Networks for Application Development and Security, Securing Applications.

UNIT V **9 Hrs**

Infrastructure and Automation: Automating Infrastructure with Standard Networking, DevOps and SRE, Basic Automation Scripting, Automation Tools, Infrastructure as Code, Automating Testing, Network Simulation, Understanding Network Programmability and Device Models, Network Management, Security Platforms.

Course Outcomes:

1. Establish a development environment within DevNet, understanding version control, coding practices, and design principles.
2. Design and integrate APIs effectively, troubleshoot connectivity issues, and utilize webhooks for seamless application integration.
3. Demonstrate proficiency in network fundamentals, identifying layers, devices, and protocols, while addressing common connectivity challenges.
4. Deploy applications with different models, implement continuous integration/deployment, consider network implications, and apply security measures.
5. Automate infrastructure tasks using scripting and tools, create Infrastructure as Code (IaC), simulate networks, and manage network devices while prioritizing security considerations.

Text Book:

1. Cisco Certified DevNet Associate DEVASC 200-901 Official Cert Guide, Patrick Gargano, Anthony Sequeira, Pearson IT Certification Publisher, 2020

Reference Books:

1. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Princeton University Press, 2016.
2. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, Andreas M. Antonopoulos, O’Reilly Media Inc, 2015.

SOTT3402u	**ADVANCED COMPUTER NETWORKS**	**L T P C** **3 0 0 3**

Prerequisite: Computer Networks

Course Description:

This course offers a comprehensive exploration of networking essentials with a focus on device configuration, switching, VLANs, network security, and wireless LANs (WLANs). We will gain the knowledge and skills necessary to configure devices, optimize network performance, ensure security, and manage wireless networks. The course aims to equip a solid foundation in networking principles, enabling them to design, configure, and troubleshoot network environments effectively.

Course Objectives:

1. Develop the ability to configure switches and routers with initial settings, implement secure remote access, and verify network connectivity.
2. Understand the concept of VLANs, configure VLANs in multi-switch environments, perform VLAN trunking, and troubleshoot inter-VLAN routing.
3. Comprehend the role of STP in network redundancy, configure EtherChannel for enhanced network capacity, and troubleshoot STP-related issues.
4. Learn to secure LANs through endpoint security, access control, and mitigation of Layer 2 security threats, including MAC address table attacks.
5. Acquire skills in managing WLAN components, understanding WLAN operation, securing WLANs, and deploying secure and efficient wireless networks.

UNIT I 9 Hrs

Device Configuration and Switching: Configure a Switch with Initial Settings, Configure Switch Ports, Secure Remote Access, Basic Router Configuration, Verify Directly Connected Networks, Frame Forwarding, Switching Domains

UNIT II 9 Hrs

VLANs: Overview of VLANs, VLANs in a Multi-Switched Environment, VLAN Configuration, VLAN Trunks, Dynamic Trunking Protocol, Inter-VLAN Routing Operation, Router-on-a-Stick Inter-VLAN Routing, Inter-VLAN Routing using Layer 3 Switches, Troubleshoot Inter-VLAN Routing.

UNIT III 9 Hrs

STP, EtherChannel and DHCPv4: Purpose of STP, STP Operations, Evolution of STP, EtherChannel Operation, Configure EtherChannel, Verify and Troubleshoot EtherChannel, DHCPv4 Concepts, Configure DHCPv4 Server, Configure DHCPv4 Client, IPv6 Global Unicast Address Assignment, SLAAC, DHCPv6, Configure DHCPv6 Server.

UNIT IV 9 Hrs

FHRP, LAN Security and Switch Security: First Hop Redundancy Protocol, HSRP, Endpoint Security, Access Control, Layer 2 Security Threats, MAC Address Table Attack, LAN Attacks, Implement Port Security, Mitigate VLAN

UNIT V **9 Hrs**

WLAN: Introduction to Wireless, Components of WLANs, WLAN Operation, CAPWAP Operation, Channel Management, WLAN Threats, , Secure WLANs, WLAN Configuration, Routing Concepts, IP Static Routing.

Course Outcomes:

1. Demonstrate the configure switches, routers, and ports, ensuring optimal network performance.
2. Implement VLANs and Trunking: Successfully create and manage VLANs, configure trunking, and troubleshoot inter-VLAN routing challenges.
3. Implement Spanning Tree Protocol (STP) for network redundancy and configure EtherChannel for enhanced capacity.
4. Implement access control measures, mitigate Layer 2 security threats, and safeguard LANs from unauthorized access.
5. Deploy secure wireless LANs, manage WLAN components, and understand WLAN operation, security, and deployment.

Text Books:

1. CCNA 200-301 Official Cert Guide, Volume 1, Wendell Odom, Cisco Press
2. CCNA Routing and Switching Complete Deluxe Study Guide, by Todd Lammle, Sybex

Reference Books:

1. Computer Networking: Principles, Protocols and Practice, Olivier Bonaventure, CreateSpace Independent Publishing Platform, 1st Edition, 2014
2. Computer Networks: A Systems Approach, Larry L. Peterson and Bruce S. Davie, Morgan Kaufmann, 5th Edition, 2011.
3. Network Security Essentials: Applications and Standards, William Stallings, Pearson, 7th Edition, 2021.
4. Routing and Switching Essentials Companion Guide, Cisco Networking Academy, Cisco Press, 1st Edition, 2013

SOTT3402v	NETWORK SECURITY	L T P C
		3 0 0 3

Course Description:

This course covers different types of attacks on networks, principles of cryptography: Symmetric Key Cryptography, Public Key Cryptography, Message Integrity, Cryptographic Hash Functions, Authentication, Digital Signatures, Certificates, Firewalls and Intrusion Detection Systems.

Course Objectives:

1. To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
2. To understand various cipher techniques.
3. To explore the various key distribution and management schemes.
4. To learn how to deploy encryption techniques to secure data in transit across data networks.
5. To learn different attacks and system security approaches.

UNIT I **9 Hrs**

Basics of Cryptography: The OSI Security Architecture -Services, mechanisms and attacks - A Model for network security – Classical encryption technique – Symmetric cipher model – Substitution technique – Rotor machines – Steganography.

UNIT II **9 Hrs**

Data Encryption: Stream Cipher - SDES - Block cipher principles – The Data Encryption Standard – The strength of DES – Advanced Encryption Standard - Triple DES.

UNIT III **9 Hrs**

Key Distribution and Key Management: Random key generation- Requirements - Linear Congruential generators- Blum Blum Shub generator Placement of encryption - Traffic confidentiality – Key distribution- Public key cryptography and RSA – Key Management - Diffie-hellman Key exchange.

UNIT IV **9 Hrs**

Network Protection, Monitoring, Detection, Authentication: Firewalls, packet filter and stateful firewalls, application aware firewalls, personal firewalls- Intrusion Detection System-Honeypots - Authentication requirements – Authentication functions – message authentication codes – Hash functions – Security of hash functions and MAC'S – MD 5 (Message Digest Algorithm) – HMAC. Digital Signatures and authentication protocols: Digital Signatures – Authentication protocols – Digital Signature Standard – Kerberos – X.509 Authentication Service.

UNIT V **9 Hrs**

Attacks and System Security:

Unauthorized access - Distributed Denial of Service (DDoS) attacks- Man in the middle attacks- Code - SQL injection attacks- Privilege escalation- Insider threats- ARP Cache poisoning- MAC flooding, Side- channel attack- The Secure Sockets Layer (SSL)- Pretty Good Privacy (PGP)- Email Security-Web Security-IP Security –Biometric Security.

Course Outcomes:

By the end of the course the student:

1. Able to explain the facts and fundamental ideas of symmetric encryption schemes.
2. Illustrate various encryption standards and its challenges in the network.
3. Experiment with key encryption mechanisms and key management strategies in new situations.
4. Design suitable network protection, monitoring and detection strategies that detect or prevent from the threat.
5. Design security strategies and resolve security issues in networks and computer systems to secure an organization / IT infrastructure.

Text Books:

1. William Stallings, Cryptography and Network Security: Principles and Practice, 8th Edition, Pearson edition, 2020.
2. Behrouz A. Forouzan, Cryptography and Network Security, McGraw-Hill, 3rd Edition 2015.

Reference Books:

1. W. Stallings, Network Security Essentials: Applications and Standards,6th Edition, Pearson Prentice Hall, 2016.
2. Bryan Sullivan and Vincent Liu, Web Application Security, A Beginner's Guide, McGraw-Hill Education, 2012.
3. C. Kaufman, R. Perlman and M. Speciner, Network Security: Private Communication in a Public World, 2nd Edition, Prentice Hall PTR, 2002.

SOTT3402w **FAULT TOLERANT SYSTEMS** **L T P C**

3 0 0 3

Course Description:

The purpose of this course is to establish fault tolerance as a measure to improve the dependability of systems in the presence of faults and correlate this dependability with the effects to the system and functional safety.

Course Objectives:

The objective of this course is to make students to:

1. To create an understanding of the fundamental concepts of fault-tolerance
2. To provide students with a working knowledge of the potential faults and errors occurring in an embedded system.
3. To provide knowledge in concepts of fault detection and fault tolerance.
4. To provide knowledge in concepts of fault prevention and forecasting.
5. To understand various fault – tolerant codes.

UNIT I **9 Hrs**

Introduction: Definition of fault tolerance, Redundancy, Applications of fault-tolerance, Fundamentals of dependability.

UNIT II **9 Hrs**

Attributes: Reliability, availability, safety, Impairments: faults, errors and failures, Means: fault prevention, removal and forecasting

UNIT III **9 Hrs**

Dependability Evaluation: Common measures: failures rate, mean time to failure, mean time to repair, etc. Reliability block diagrams, Markov processes.

Hardware redundancy, Redundancy schemes, Evaluation and comparison, Applications, Information redundancy.

UNIT IV **9 Hrs**

Codes: linear, Hamming, cyclic, unordered, arithmetic, etc., Encoding and decoding techniques, Applications, Time redundancy

UNIT V **9 Hrs**

Programming:Software fault tolerance, Specific features, Software fault tolerance techniques : N-version programming, recovery blocks, self-checking software, etc.

Course Outcomes:

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

1. Understand the concepts of fault detection, tolerance and correction mechanisms inreal world scenarios.
2. Ability to design and develop dependable systems for mission critical applications.
3. Apply the mean time and mean time to repair

4. Apply the Redundancy schemes
5. Utilize the various Code Techniques

Text Books:

1. Anderson, T., and P.A. Lee, Fault-Tolerant Principles and Practices, Prentice-Hall
2. Hwang, K., and F.A. Briggs, Computer Architecture and Parallel Processing, McGraw-Hill.Jalote, P.
3. Fault-Tolerance in Distributed Systems, ISBN 0-13-301367-7, Prentice-Hall,

Reference Books:

1. Johnson, B.W., Design and Analysis of Fault-Tolerant Systems, Addison Wesely
2. Leveson, Nancy G., Safeware, system safety and computers, Addison Wesely.
3. Pradhan, D.K., Fault-Tolerant Computing — Theory and Techniques, (2 Volumes), Prentice-Hall.
4. Pradhan, Dhiraj K., Fault-Tolerant Computer System Design, ISBN 0-13-057887-8, Prentice-Hall PTR

SOTT3402x **COMPUTATIONAL INTELLIGENCE** **L T P C**
3 0 0 3

Prerequisite: Artificial Intelligence

Course Description:

This course mainly designed to explore the principles, methods, and applications of artificial intelligence techniques inspired by natural systems. This course delves into the realm of intelligent systems that can learn, adapt, and make decisions based on data and experience. By fusing concepts from neural networks, fuzzy logic, evolutionary algorithms, and swarm intelligence, students will gain a comprehensive understanding of how these methods can solve complex problems in various domains.

Course Objectives:

1. Understand the core principles and theories of computational intelligence, including neural networks, fuzzy logic, evolutionary algorithms, and swarm intelligence.
2. Implementation and application of neural networks, fuzzy logic, evolutionary algorithms, and swarm intelligence to solve complex problems.
3. Develop the ability to identify real-world challenges suitable for computational intelligence approaches and apply these methods effectively for practical solutions.
4. Recognize the ethical implications of computational intelligence applications, including bias mitigation, transparency, and societal impact.
5. Learn to combine computational intelligence techniques creatively, fostering the design of innovative solutions across diverse domains.

UNIT I **6 Hrs**

Introduction to Computational Intelligence: Computational Intelligence, Paradigms of Computational Intelligence, Approaches to Computational Intelligence, Applications of Computational Intelligence.

UNIT II **12 Hrs**

Fuzzy Logic: Fuzzy sets, properties, membership functions, fuzzy operations. Fuzzification, Defuzzification and Inference Mechanism, Fuzzy Modelling, Fuzzy Control, Design of Fuzzy Controller Evolutionary Computation, constituent algorithms, Swarm intelligence algorithms, Overview of other bio-inspired algorithm, Hybrid approaches.

UNIT III **9 Hrs**

Neural Network: Biological and artificial neuron, Network Architecture, Activation Functions, supervised and unsupervised learning. Single layer Perceptron, Multilayer Perceptron, Back propagation learning, Hopfield networks, Bidirectional Associative Memory. Topologically organized neural networks.

UNIT IV **9 Hrs**

Evolutionary Fuzzy Systems and Hybrid Models: Evolutionary Adaptive Fuzzy Systems, Objective Functions and Evaluation, Fuzzy Adaptive Evolutionary Algorithms, Supportive Combinations, Collaborative Combinations.

UNIT V **9 Hrs**

Intelligence and Applications: Cooperative Neuro-Fuzzy Systems, Adaptive Neuro-Fuzzy System, Natural language processing, Morphological Analysis, Language Models, Information Retrieval, Information Extraction, Machine Translation, Machine Learning, Symbol-Based Machine Learning.

Course Outcomes:

1. Demonstrate a clear understanding of computational intelligence paradigms, approaches, and their applications.
2. Designing and implementing fuzzy logic systems, including membership functions, fuzzification, defuzzification, and inference mechanisms and applying evolutionary computation techniques and hybrid approaches for problem-solving.
3. Constructing and training neural networks for various tasks.
4. Comprehend the concept of evolutionary adaptive fuzzy systems and utilize fuzzy adaptive evolutionary algorithms.
5. Utilizing computational intelligence techniques and demonstrate applications of computer intelligence.

Text Books:

1. Computer Intelligence, Nazmul Siddique and Hojjat Adeli, John Wiley & Sons Inc Publications, 1/e, 2013.,
2. Computational Intelligence: Principles, Techniques and Application, Konar A., Springer Verlag, 2005.

Reference Books:

1. Neural Networks – A Classroom Approach, Kumar S, Tata McGraw Hill, 2004.
2. Fundamentals of Computational Swarm Intelligence, Engelbrecht, A.P, John Wiley & Sons, 2006.
3. Fuzzy Logic with Engineering Applications, Ross T J, McGraw Hill, 2002
4. Introduction to Evolutionary Computing, Eiben A E and Smith J E, Second Edition, Springer, Natural Computing Series, 2007.
5. Neuro – Fuzzy and Soft Computing, Jang J S R and Sun C T, Mizutani E, PHI, 2002.

SOTT3402y **DATA ANALYTICS WITH TABLEAU** **L T P C**
3 0 0 3

Prerequisite: Data Analytics using Python

Course Description:

The course focuses on understanding fundamental concepts, utilizing Tableau's functionalities, and applying advanced visualization techniques to enhance quality insights. Students will learn data preparation, analysis, and effective visualization through real-world case studies, empowering them to make informed decisions and drive quality improvements.

Course Objectives:

1. Understand a strong foundation in data analytics concepts, business intelligence applications, and pattern recognition, fostering the ability to recognize valuable insights from data.
2. Acquire proficiency in using Tableau for data visualization and analysis, encompassing connecting to data sources.
3. Develop skills to manipulate data within Tableau, including connecting to different data sources, working with extracts.
4. Creating diverse visualizations like histograms, scatter plots, box plots, maps, and more, to enhance quality analysis insights.
5. Applying data analytics to real-world quality case studies, thereby applying learned concepts in practical scenarios.

UNIT I **9 Hrs**

Basic Concepts of Data Analytics: Business Intelligence Concepts and Applications, Pattern Recognition, Data Processing Chain, Data Warehousing: DW Architecture, Data Sources, Data Loading Processes, Data Mining: Gathering and selecting data, Data cleansing and preparation, Outputs of Data Mining, Evaluating Data Mining, Results Data Mining, Techniques Tools and Platforms for Data Mining.

UNIT II **9 Hrs**

Tableau Fundamentals: Exploring Tableau, The cycle of analytics, Connecting to data, Foundations for building visualizations, Measures and dimensions, Visualizing data, Geographic visualizations, Dashboard interface.

UNIT III **9 Hrs**

Working with Data in Tableau: The Tableau paradigm, connecting to data, working with extracts instead of live connections, Tableau file types, Metadata and sharing connections, Joins and blends, Filtering data.

UNIT IV **9 Hrs**

Advanced Visualization and Calculations: Stacked Bar Chart, Histogram, Butterfly Char, Donut Chart, Scatter Plot, Bubble Chart, Box Plot, Pareto Chart, Bump Chart, Maps, Gantt Chart, Adventure with Calculations, Diving Deep with Table Calculations.

UNIT V **9 Hrs**

Data Prep and Structuring: Cleaning and Structuring Messy Data, Introducing Tableau Prep, Case Studies: Red Wine Quality, Airline Passenger Satisfaction, Driverless Car Failure and Seoul Bike Sharing Demand.

Course Outcomes:

1. Develop a solid foundation in data analytics, business intelligence, and pattern recognition, enabling them to extract valuable insights from complex datasets.
2. Analysing and creating interactive dashboards and effectively communicating findings.
3. Apply data manipulation techniques within Tableau, such as connecting to various data sources, performing joins and blends,
4. Demonstrate their analytical skills by discerning complex patterns and trends in quality analysis data, contributing to in-depth insights and informed decision-making.
5. Integrate data analytics and visualization techniques into real-world quality case studies.

Text Books:

1. Data Analytics Made Accessible, Anil K. Maheshwari, 2023 e-book edition.
2. Learning Tableau, Joshua N. Milligan, 3rd Edition, Packt Publishing, 2019

Reference Books:

1. Data Analytics and Visualization in Quality Analysis using Tableau, Jaejin Hwang and Youngjin Yoon, CRC Press, 2022.
2. Mastering Tableau 2021, Marleen Meier and David Baldwin, Packt Publishing, 2021.

SOTT3402z **HUMAN COMPUTER INTERACTION** **L T P C**
3 0 0 3

Course Description:
This course introduces the fundamental theories and concepts of human-computer interaction (HCI). HCI is an interdisciplinary field that integrates theories and methodologies across many domains including cognitive psychology, neurocognitive engineering, computer science, human factors, and engineering design. Students will gain theoretical knowledge of and practical experience in the fundamental aspects of human perception, cognition, and learning as relates to the design, implementation, and evaluation of interfaces.

Course Objectives:
The objective of this course is to make students to:
1. To provide the basic knowledge on the levels of interaction, design models, techniques, and validations focusing on the different aspects of human-computer interface and interactions
2. To make the learners think in a design perspective and to evaluate interactive design
3. To use the concepts and principles of HCI to analyze and propose solutions for real life applications
4. To become familiar with recent technology trends
5. To explore challenges in the HCI domain

UNIT I **9 Hrs**
HCI Foundations: Input–output channels, Human memory, Thinking: reasoning and problem solving, Emotion, Individual differences, Psychology and the design of interactive systems, Text entry devices, Positioning, pointing and drawing, Display devices, Devices for virtual reality and 3D interaction, Physical controls, sensors and special devices

UNIT II **9 Hrs**
Designing Interaction: Overview of Interaction Design Models, Discovery - Framework, Collection - Observation, Elicitation, Interpretation - Task Analysis, Storyboarding, Use Cases, Primary Stakeholder Profiles, Project Management Document

UNIT III **9 Hrs**
Interaction Design Models: Model Human Processor - Working Memory, Long-Term Memory, Processor Timing, Keyboard Level Model - Operators, Encoding Methods, Heuristics for M Operator Placement, What the Keyboard Level Model Does Not Model, Application of the Keyboard Level Model, GOMS - CMNGOMS Analysis, Modeling Structure, State Transition Networks - Three-State Model, Glimpse Model, Physical Models, Fitts' Law

UNIT IV **9 Hrs**
Guide Lines in HCI : Shneideman's eight golden rules, Norman's Sever principles, Norman's model of interaction, Nielsen's ten heuristics, Heuristic evaluation, contextual evaluation, Cognitive walk-through

UNIT V **9 Hrs**

Collaboration And Communication: Face-to-face Communication, Conversation, Text-based Communication, Group working, Dialog design notations, Diagrammatic notations, Textual dialog notations, Dialog semantics, Dialog analysis and design

Course Outcomes:

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

1. Enumerate the basic concepts of human, computer interactions
2. Create the processes of human-computer interaction life cycle
3. Analyze and design the various interaction design models
4. Apply the interface design standards/guidelines for evaluating the developed interactions
5. Establish the different levels of communication across the application stakeholders

Text Books:

1. A Dix, Janet Finlay, G D Abowd, R Beale., Human-Computer Interaction, 3rd Edition, Pearson Publishers,2008
2. Thomas S. Huang," Real-Time Vision for Human-Computer Interaction", Springer 5. Preece et al, Human-Computer Interaction, Addison-Wesley, 1994

Reference Books:

1. Shneiderman, Plaisant, Cohen and Jacobs, Designing the User Interface: Strategies for Effective Human Computer Interaction, 5th Edition, Pearson Publishers, 2010.
2. Hans-Jorg Bullinger, "Human-Computer Interaction", Lawrence Erlbaum Associates, Publishers
3. Jakob Nielsen, "Advances in Human-computer Interaction",Ablex Publishing Corporation

Program Elective -II

BTCT3602a	**DEEP LEARNING**	**L T P C** **3 0 0 3**

Prerequisite: Python Programming, Machine Learning

Course Description:

This course introduces students to the fascinating field of deep learning, which is a subset of machine learning focused on neural networks and their applications. Students will learn about neural network architectures, training techniques, and various deep learning applications, preparing them for real-world projects and research opportunities.

Course Objectives:

1. Understand the fundamentals of deep learning, including activation functions and Optimization Techniques.
2. Learn about the Neural Networks.
3. Learn and analysis the conventional neural networks.
4. Learn and analysis the recurrent neural networks.
5. Understand an image processing using DL algorithms

UNIT I **9 Hrs**

Introduction to Deep Learning: Introduction to Deep Learning, Bayesian Learning, Decision Surfaces, Deep Feed, Forward Neural Networks, Gradient Descent, Back-Propagation and Other Differentiation Algorithms, Rectified Linear Unit (ReLU), Heuristics for Avoiding Bad Local Minima, Heuristics for Faster Training, Nestors Accelerated Gradient Descent, Regularization for Deep Learning, Optimization Techniques, Gradient Descent, Batch Optimization.

UNIT II **9 Hrs**

Neural Network: Introduction to Neural Network, Multilayer Perceptron, Back Propagation Learning, Unsupervised Learning with Deep Network, Autoencoders.

UNIT III **9 Hrs**

Convolutional Neural Networks: Convolutional Neural Network, building blocks of CNN, CNN Architectures, Convolution, Pooling Layers, Transfer Learning, Image Classification using Transfer Learning, Revisiting Gradient Descent, Momentum Optimizer, RMSProp, Adam. Case study: Develop a simple application for Classify the animals by using CNN approach.

UNIT IV **9 Hrs**

Recurrent Neural Networks: Recurrent and Recursive Nets – Recurrent Neural Networks – Deep Recurrent Networks – Recursive Neural Networks – Applications, Case study: Develop a simple application for Classify the cancer by using RNN approach.

UNIT V **9 Hrs**

Image Processing using DL: Classical Supervised Tasks with Deep Learning, Image Denoising, Semantic Segmentation, Object Detection, LSTM Networks, Generative Modelling with DL, Case Study: Implement of any one deep learning algorithm with TensorFlow and Keras tools.

Course Outcomes:

1. Understand the role of deep learning in machine learning applications.
2. Demonstrate the neural networks.
3. Design and implement convolutional neural networks.
4. Design and implement recurrent neural networks.
5. Demonstrate and Analysis the image processing in deep learning.

Text Books:

1. Deep Learning- Ian Goodfelllow, Yoshua Benjio, Aaron Courville, The MIT Press, 2017
2. Pattern Classification, Richard O. Duda, Peter E. Hart, David G. Stork, John Wiley & Sons Inc.

Reference Books:

1. Deep Learning for Computer Vision, Rajalingappaa Shanmugamani, Packt Publishing, 2018.
2. Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence, Phil Kim, Apress, 2017.
3. Convolutional Neural Networks in Visual Computing, Ragav Venkatesan, Baoxin Li, CRC Press, 2018.
4. Neural Network for Beginners: Build Deep Neural Networks and Develop Strong Fundamentals using Python's NumPy, and Matplotlib, Sebastian Klaas, BPB Publications, 2021.

BTCT3602b INTRUSION DETECTION SYSTEM

	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

Course Description:

This course covers a comprehensive range of topics related to intrusion detection, prevention, and analysis, with a specific focus on the practical application of the Snort tool. Students will gain knowledge about the historical context, various types of threats, response strategies, and hands-on experience with Snort for intrusion detection and prevention.

Course Objectives:

1. Comprehend the historical evolution and key concepts of intrusion detection and audit techniques.
2. Gain skills to effectively use various IDS and IPS technologies, including hybrid approaches.
3. Develop the ability to independently install, configure, and use Snort in diverse scenarios.
4. Foster analytical skills for intrusion detection, encompassing vulnerability analysis and response strategy formulation.
5. Explore advanced techniques, including ACID and Snort Snarf, and understand different IDS and IPS architecture models.

UNIT I 9 Hrs

History of Intrusion detection, Audit, Concept and definition , Internal and external threats to data, attacks, Need and types of IDS, Information sources Host based information sources, Network based information sources.

UNIT II 9 Hrs

Intrusion Prevention Systems, Network IDs, protocol based IDs ,Hybrid IDs, Analysis schemes, thinking about intrusion. A model for intrusion analysis techniques, Responses requirement of responses, types of responses mapping, responses to policy Vulnerability analysis, credential analysis, non credential analysis.

UNIT III 9 Hrs

Introduction to Snort, Snort Installation Scenarios, Installing Snort, Running Snort on Multiple Network Interfaces, Snort Command Line Options. Step-By-Step Procedure to Compile and Install Snort Location of Snort Files, Snort Modes Snort Alert Modes

UNIT IV 9 Hrs

Working with Snort Rules, Rule Headers, Rule Options, The Snort Configuration File etc. Plugins, Preprocessors and Output Modules, Using Snort with MySQL

UNIT V 9 Hrs

Using ACID and Snort Snarf with Snort, Agent development for intrusion detection, Architecture models of IDs and IPs.

Course Outcomes:

1. Articulate the historical evolution of intrusion detection, define key concepts, and understand cybersecurity importance.
2. Demonstrate proficiency in deploying various IDS and IPS technologies informed by threat assessments.

3. Install, Configure and use Snort for intrusion detection across multiple network interfaces.
4. Ability to analyze intrusions, conduct vulnerability assessments and formulate responses aligned with security policies.
5. Apply advanced techniques, including ACID and Snort Snarf, and develop custom agents for tailored intrusion detection solutions. Understand different architecture models of IDS and IPS.

Text Book:

1. Rafeeq Rehman : " Intrusion Detection with SNORT, Apache, MySQL, PHP and ACID," 1st Edition, Prentice Hall , 2003.

Reference Books:

1. Christopher Kruegel,Fredrik Valeur, Giovanni Vigna: "Intrusion Detection and Correlation Challenges and Solutions", 1st Edition, Springer, 2005.
2. Carl Endorf, Eugene Schultz and Jim Mellander " Intrusion Detection & Prevention", 1st Edition, Tata McGraw-Hill, 2004.
3. Stephen Northcutt, Judy Novak : "Network Intrusion Detection", 3rd Edition, New Riders Publishing, 2002.
4. T. Fahringer, R. Prodan, "A Text book on Grid Application Development and Computing Environment". 6th Edition, KhannaPublihsers, 2012.

BTCT3602c **INTERNETWORKING WITH TCP/IP** **L T P C**

3 0 0 3

Course Description:

The "Internetworking with TCP/IP" course is a comprehensive exploration of networking principles, focusing on the OSI Model and the TCP/IP Protocol Suite. Delve into underlying network technologies, protocol layers, and addressing schemes, both in wired Local Area Networks (LANs) and Wireless LANs. Subsequent units cover crucial topics such as network layer services, IPv4 addressing, delivery and forwarding of IP packets, and security measures in Internet Protocol Version 4 (IPv4).

Course Objectives:

1. Grasp fundamental concepts of network technologies, OSI Model, TCP/IP Protocol Suite, and addressing in wired and wireless LANs.
2. Master switching, packet switching, Network Layer services, and IPv4 addresses (classful and classless addressing).
3. Examine IP packet delivery, forwarding, router structure, and IPv4 details, including datagrams, fragmentation, options, checksum, and security.
4. Investigate ARP's role in address mapping, ICMPv4 messages and debugging tools, and understand Mobile IP principles and inefficiencies.
5. Analyse unicast routing protocols (RIP, OSPF, BGP) for intra- and inter-domain routing, configure DHCP for host setup, and comprehend FTP/TFTP for file transfers.

UNIT I **9 Hrs**

Introduction and Underlying Network Technologies, The OSI Model and the TCP/IP Protocol Suite : Protocol Layers , The OSI Model , TCP/IP Protocol Suite , Addressing, Wired Local Area Networks : Wireless LANS, Connecting Devices

UNIT II **9 Hrs**

Introduction To Network Layer : Switching, Packet Switching At Network Layer, Network Layer Services, Other Network Layer Issues, Ipv4 Addresses: Classful Addressing, Classless Addressing, Special Addresses

UNIT III **9 Hrs**

Delivery and Forwarding of IP Packets: Delivery, Forwarding, Structure of a Router Internet Protocol Version 4 (IPv4) : Datagrams, Fragmentation, Options, checksum, IP OVER ATM, Security, IP Package

UNIT IV **9 Hrs**

Address Resolution Protocol (ARP): ADDRESS MAPPING, THE ARP PROTOCOL, ATMARP, ARP PACKAGE Internet Control Message Protocol Version 4(ICMPv4): MESSAGES, DEBUGGING TOOLS, ICMP PACKAGE Mobile IP : Address ,Agents , Three Phases, Inefficiency In Mobile IP.

UNIT V **9 Hrs**

Unicast Routing Protocols (RIP, OSPF, and BGP) : Introduction, Intra- And Inter-Domain Routing, Distance Vector Routing,RIP, Link State Routing, OSPF, Path Vector Routing, BGP Host Configuration: DHCP : Introduction, DHCP Operation, Configuration, File Transfer: FTP and TFTP

Course Outcomes:

1. Understand the functionality of each layer in the TCP/IP protocol with examples.
2. Implement subnetting and supernetting for classful architecture and show how they were used to overcome the deficiency of classful addressing.
3. Use various routing protocols in autonomous systems.
4. Implement address resolution protocol (ARP), which can be used to dynamically map a logical address to a physical address
5. Demonstrate dynamic host configuration protocol in the wired network.

Text Book:

Behrouz A Forouzan, "TCP/IP Protocol Suite", TMH, 4 th Edition,2010

Reference Books:

1. Mahbub Hasan & Raj Jain, " High performance TCP/IP Networking", PHI -2005
2. Douglas. E.Comer, "Internetworking with TCP/IP ", Volume I PHI
3. Larry L. Perterson and Bruce S. Davie , "Computer Networks- A Systems Approach", 2011, Morgan Kaufmann
4. B.A. Forouzan, "Data communication & Networking", TMH, 4th Edition

BTCT3602d **DIGITAL SIGNAL PROCESSING** **L T P C**
3 0 0 3

Course Description:
This course is designed to give students the required knowledge for DFT, FFT, Z Transforms and its computation and understand the design techniques for digital filters.

Course Objectives:
1. To make students aware about the meaning and implications of the properties of systems and signals.
2. Understand frequency analysis of both continuous and discrete signals.
3. Understand frequency response of linear time invariant (LTI) systems.
4. Understand discrete Fourier transform, its properties, and applications.
5. Design digital filters both FIR, IIR filters and understand of multi-rate signal processing.

UNIT I **8 Hrs**
Basic elements of digital signal Processing: Concept of frequency in continuous time and discrete time signals –Sampling theorem – Discrete time signals. Discrete time systems – Analysis of Linear time invariant systems –Z transform –Convolution and correlation.

UNIT II **10 Hrs**
Introduction to DFT: Efficient computation of DFT Properties of DFT – FFT algorithms – Radix-2 and Radix-4 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms – Use of FFT algorithms in Linear Filtering and correlation.

UNIT III **10 Hrs**
Structure of IIR: System Design of Discrete time IIR filter from continuous time filter – IIR filter design by Impulse Invariance. Bilinear transformation – Approximation derivatives – Design of IIR filter in the Frequency domain.

UNIT IV **7 Hrs**
Symmetric & Anti-symmetric FIR filters: Linear phase filter – Windowing techniques – rectangular, triangular, Blackman and Kaiser windows – Frequency sampling techniques – Structure for FIR systems.

UNIT V **10 Hrs**
Finite word length effects in FIR and IIR digital filters: Quantization, round off errors and overflow errors. Multi rate digital signal processing: Concepts, design of practical sampling rate converters, Decimators, interpolators. Polyphase decompositions. Application of DSP – Model of Speech Wave Form – Vocoder.

Course Outcomes:
After the completion of the course the student will be able to:
1. Describe discrete time signals & systems and represent in frequency domain .

2. Compute DFT using FFT algorithms and derive DFT properties .
3. Design IIR digital filters using various techniques .
4. Design FIR digital filters using various techniques .
5. Interpret the finite word length effects on functioning of digital filters.

Text Books:

1. Oppenheim A V and Sehafer R W, “Discrete Time Signal Processing”, Prentice Hall (1989).
2. Proakis J G and Manolakis D G, “Digital Signal Processing”, Pearson Education India.

References Books:

1. Oppenheim A V, Willsky A S and Young I T, “Signal & Systems”, Prentice Hall, (1983).
2. Ifeachor and Jervis, “Digital Signal Processing”, Pearson Education India.
3. DeFatta D J, Lucas J G and Hodgkiss W S, “Digital Signal Processing”, J Wiley and Sons, Singapore, 1988

BTCT3602e **DATABASE ADMINISTRATION** **L T P C**
3 0 0 3

PRE-REQUISITES: A course on Database Management Systems

Course Description:

This course familiarizes students with different concepts of database administration including DBA Roles and responsibilities, tablespace and storage management, DB backup, restoration and recovery, security, multitenant, and performance tuning.

Course Objectives:

The main objective of this course is to provide knowledge of different concepts of database administration so that the students will be able handle

1. Install DBMS Software
2. Create and manage databases
3. Manage backup and recovery
4. Control user security
5. Managing database performance and multitenant architecture

UNIT I **10 Hrs**

Introduction, Tablespace and Storage management: DBA Roles and Responsibilities; Database Architecture; ORACLE logical and physical database structure; Memory and Process Structure, SQLPLUS Overview, creating a database.

Working with Tablespaces and Data Files, Creating and adding tablespace and datafiles, Managing Control Files, Online Redo Logs and Archive logs; Multiplexing

UNIT II **8 Hrs**

Managing Database Objects: Working with Tables and Constraints; Working with Indexes, Views, Synonyms, and Sequences; Partitioning and Materialized Views, Introduction of PLSQL, Stored Procedure, Functions, Trigger, package

UNIT III **10 Hrs**

Database Backup, Restore, and Recovery: Backup and Recovery Overview, Database backup, restoration and recovery, defining a backup and recovery strategy, Backup and Recovery options; Data Dump; User-Managed Backup and Recovery; Configuring RMAN; RMAN Backups, Restore and Recovery; High Availability Features; Oracle Data Guard; Flashback operations.

UNIT IV **7 Hrs**

Database Security and Auditing: Database Security and Auditing; Database Authentication Methods; Database Authorization Methods; Data Encryption Techniques, Virtual Private Database; Managing Users and Security: Profiles, managing users, managing privileges, managing roles.

UNIT V **10 Hrs**

Multitenant Database Architecture and Database Tuning: Understanding the Multitenant Architecture, Pluggable Architecture; Creating CDB; Administrating Root Container; Creating Pluggable Databases (PDBs) within a CDB; Administrating Pluggable Databases; Backup and Recovery in multitenant Environment; Databases in the Cloud.

Tuning Application Design; Tuning Memory Usage; Tuning Data Access; Tuning Data Manipulation; Reducing Network Traffic; Using Automatic Workload Repository (AWR); Automatic Database Diagnostic Monitor (ADDM), Tuning SQL; SQL Tuning Advisor, Performance Tuning in a Multitenant Environment; Distributed Databases and Networking Tool

Course Outcomes:

After completion of the course, students will be able to

1. Understand the roles and responsibilities of DBA and Database architecture.
2. Create various database objects like Indexes, Sequences, Views and also know how to create triggers and stored procedures.
3. Know how to create database backup and recovering data in case of disasters.
4. Able to know how to provide security for the data stored in the database.
5. Understand the concept of database tuning.

Text Books:

1. Database Administration: The Complete Guide to DBA Practices and Procedures By Craig S. Mullins, Second Edition, Addison Wesley.
2. Oracle 19c Database Administration: Oracle Simplified, Tanveer A

Reference Books:

1. SQL & PL / SQL for Oracle 11g Black Book, P.S. Deshpande, Dreamtech.
2. Oracle 11g Administration in Simple Steps, Kogent Solutions Inc.

Program Elective -III

BTCT3603a SOFTWARE PROJECT MANAGEMENT

L	T	P	C
3	0	0	3

Prerequisites: A basic understanding of Software Engineering

Course Description: This course is aimed at introducing the primary important concepts of project management related to managing software development projects. They will also get familiar with the different activities involved in Software Project Management. Further, they will also come to know how to successfully plan and implement a software project management activity, and to complete a specific project in time with the available budget.

Course Objectives:

The course should enable the students to:

1. To understand the Software Project Planning and Evaluation techniques.
2. To plan and manage projects at each stage of the software development life cycle (SDLC).
3. To learn about activity planning and risk management principles.
4. To manage software projects and control software deliverables.
5. To develop skills to manage the various phases involved in project management and people management.

UNIT I **9 Hrs**

Project Evaluation and Project Planning: Importance of Software Project Management – Activities – Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

UNIT II **9 Hrs**

Project Life Cycle and Effort Estimation: Software process and Process Models – Choice of Process models – Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming– Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points – COCOMO II – a Parametric Productivity Model.

UNIT III **9 Hrs**

Activity Planning and Risk Management: Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning –Risk Management – – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical paths – Cost schedules.

UNIT IV **9 Hrs**

Project Management and Control: Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – Prioritizing

Monitoring – Project tracking – Change control – Software Configuration Management – Managing contracts – Contract Management.

UNIT V **9 Hrs**

Staffing in Software Projects: Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures – Dispersed and Virtual teams – Communications genres – Communication plans – Leadership.

Course Outcomes:

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

1. Understand the basic concepts, terminologies and issues of software project management.
2. Identify & analyze the different project contexts and suggest an appropriate management strategy.
3. Practice the role of professional ethics in successful software development.
4. Identify and describe the key phases of project management.
5. Determine an appropriate project management approach through an evaluation of the business context and scope of the project.

Text Books:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.
2. Software Project Management, by Walker Royce, Pearson Education

Reference Books:

1. Effective project management: Traditional, Agile, Extreme, Robert Wysocki, Sixth Edition, Wiley India, 2011.
2. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition, Tata Mc-Graw Hill,2006
3. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O'Reilly, 2006.

BTCT3603b **HIGH PERFORMANCE COMPUTING** **L T P C**
3 0 0 3

Course Description:

High Performance Computing most generally refers to the practice of aggregating computing power in a way that delivers much higher performance than one could get out of a typical desktop computer or workstation to solve large problems in science, engineering, or business.

Course Objectives:

1. To introduce the concepts of Modern Processors.
2. To introduce Optimization techniques for serial code.
3. To introduce Parallel Computing Paradigms.
4. To introduce Parallel Programming using OpenMP and MPI.
5. To understand efficient communication method

UNIT I **9 Hrs**

Modern Processors: Stored Program Computer Architecture- General purpose cache- based microprocessor- Memory Hierarchies - Multicore processors- Muti-threaded processors- Vector Processors.

Basic optimization techniques for serial code: scalar profiling- common sense optimizations- simple measures, large impact- The role of compilers - c++ optimizations - Data access optimization: Balance analysis and light speed estimates- storage order.

case study: The Jacobi algorithm, Dense matrix transpose, Sparse matrix- vector

UNIT II **10 Hrs**

Parallel Computers: Taxonomy of parallel computing paradigms- Shared memory computers- Cache coherence- UMA - ccNUMA- Distributed-memory computers- Hierarchical systems- Networks- Basic performance characteristics Buses- Switched and fat- tree networks- Mesh networks- Hybrids - Basics of parallelization - Why parallelize - Data Parallelism - Function Parallelism Parallel Scalability- Factors that limit parallel execution- Scalability metrics Simple scalability laws- parallel efficiency - serial performance Vs Strong scalability- Refined performance models- Choosing the right scaling base line

Case Study: Can slow processors compute faster- Load balance.

UNIT III **8 Hrs**

Distributed memory parallel programming with MPI: message passing - introduction to MPI – example - messages and point-to-point communication - collective communication – nonblocking point-to-point communication- virtual topologies - MPI parallelization of Jacobi solver- MPI implementation - performance properties

UNIT IV **9 Hrs**

Shared memory parallel programming with OpenMP: introduction to Open Mp - parallel execution - data scoping- OpenMP work sharing for loopssynchronization - reductions - loop scheduling - tasking - case study: Open Mpparallel jacobi algorithm- advanced

OpenMpwavefront parallelization- Efficient OpenMP programming: Profiling OpenMP programs - Performance pitfalls Case study: Parallel Sparse matrix-vector multiply.

UNIT V **9 Hrs**

Efficient MPI programming: MPI performance tools- communication parameters- Synchronization, serialization, contention- Reducing communication overhead- optimal domain decomposition- Aggregating messages – Nonblocking Vs Asynchronous communication- Collective communication- Understanding intra-node point-to-point communication.

Course Outcomes:

On completion of the course, student will be able to:

1. Understand the advantages, issues and challenges of the current processors
2. Apply how to optimize a parallel code.
3. Understand the various parallel programming paradigms and learn how to choose the right one based on the application domain.
4. Analyze parallel codes that are optimized for performance.
5. Implement MPI programming for developing efficient programs

Text Books:

1. Georg Hager, Gerhard Wellein, Introduction to High Performance Computing for Scientists and Engineers, Chapman & Hall / CRC Computational Science series, 2011.
2. Introduction to Parallel Computing, Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, 2nd edition, Addison-Welsey, 2003.

Reference Books:

1. Grama, A. Gupta, G. Karypis, V. Kumar, An Introduction to Parallel Computing, Design and Analysis of Algorithms: 2/e, Addison-Wesley, 2003.
2. G.E. Karniadakis, R.M. Kirby II, Parallel Scientific Computing in C++ and MPI: A Seamless Approach to Parallel Algorithms and their Implementation, Cambridge University Press,2003.
3. Charles Severance, Kevin Dowd, High Performance Computing, O'Reilly Media, 2nd Edition, 1998.
4. Kai Hwang, Faye Alaye Briggs, Computer Architecture and Parallel Processing, McGraw Hill, 1984.

BTCT3603c **MERN TECHNOLOGIES** **L T P C**
3 0 0 3

Course Description:

The MERN React Full Stack Web Developer certification validates proficiency in full stack frameworks. MERN stands for MongoDB, Express.js, React.js, and Node.js - a set of JavaScript technologies enabling developers to build complex, robust web applications. MongoDB is a database system, Express.js manages the backend, React.js handles the frontend and Node.js enables server-side scripting. Industries primarily use this certification to authenticate a developer's competence in using these technologies for designing, developing, testing, deploying and maintaining web applications. It is extremely popular due to the rising demand for professionals proficient in full stack development, especially those adept at using these specific technologies.

Course Objectives:

The primary learning objectives of the MERN React Full Stack Web Developer course is to Equip learners with a comprehensive understanding of the MERN Stack that includes MongoDB, Express.js, React.js and Node.js, which are essential for full stack development.

1. Get understand about MERN and its components.
2. Analyze the react components and react state.
3. Learn to integrate the technologies to Express and Graph to build applications.
4. Expertise and understand the various concepts of Mongo DB.
5. Get depth understanding of node environment and Asynchronous Event Driven Programming, file accessing.

UNIT I **9 Hrs**

Introduction: What's MERN? MERN Components, Why MERN. Hello World. Hello World: Server-Less Hello World, JSX, Project Setup, Express, Separate Script file, JSX Transform, Older Browsers Support, Automate.

UNIT II **9 Hrs**

React Components: Issue Tracker, React Classes, Composing Components, Passing Data Using Properties, Passing Data Using Children, Dynamic Composition.

React State: Initial State, Async State Initialization, Updating State, Lifting State Up, Event Handling, Stateless Components, Designing Components.

UNIT III **9 Hrs**

Express and GraphQL: Express, REST API, Graph QL, About API, GraphQL Schema File, List API, List API Integration, Custom Scalar Types, The Create API, Create API Integration, Query Variables, Input Validations, Displaying Errors.

UNIT IV **9 Hrs**

Mongo DB: Mango DB basics, MongoDB CRUD Operations, MongoDB Node.js Driver, Schema Initialization, Reading from Mongo DB, Writing to Mongo DB.

UNIT V **9 Hrs**

Understanding Node environment: Extending JavaScript, V8, The Process Object.
Understanding Asynchronous Event Driven Programming: Broadcasting Events, Listening for Events, Timers, Understanding the Event Loop, Callbacks and errors.
Streaming Data Across Node And clients: Exporting Steams, Creating and HTTP Server, The Request objects, Working with Headers, Handling Post Data.
Access the File System: Directories & iterating overs files and folders, Reading from File, Writing to a File.

Course Outcomes:

Upon the completion of this course the student will be able to,

1. Understand the MERN and its components.
2. Examine and can use the react components and react state.
3. Integrate the technologies to build Application Programming Interface using Express and GraphQL.
4. Analyze and understand the various concepts of Mongo DB.
5. Gain in depth understanding about node environment and Asynchronous Event Driven Programming, file accessing.

Text Books:

1. Vasan Subramanian, Pro MERN Stack, Apress, 2019.
2. Eddy Wilson Iriarte Koroliova, MERN Quick Start Guide, Packt, 2018.

Reference Books:

1. Shama Hoque, Full Stack React Projects, Packt, Second Edition, 2020.
2. Vishal Kamal, Beginner's Guide to MERN Technology: Building Modern Web Applications,
3. Daniel Watrous, Learning Path: Mastering MERN, Packt Publishing, 2016.

BTCT3603d	**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. We 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 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 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: Cybersecurity Threats, Vulnerabilities, Attacks and Protecting Secrets **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.

Course Outcomes:

1. Demonstrate various cyber threats and vulnerabilities, understanding their potential impact on digital assets.
2. Implement proactive measures to mitigate cyber threats and protect against common attack vectors.
3. Apply cryptographic techniques to ensure data integrity, authenticity, and confidentiality.
4. Develop incident response plans and disaster recovery strategies to minimize the impact of cybersecurity incidents.
5. Understand to ethical principles and professional responsibilities while making informed decisions in the realm of cybersecurity.

Text Books:

1. CISSP (ISC)2 Certified Information Systems Security Professional Official Study Guide, Mike Chapple, James Michael Stewart and Darril Gibson, 9th Edition
2. Cybersecurity: The Beginner's Guide, Dr. Erdal Ozkaya, Packt Publishing Limited, 2019.

Reference Books:

1. Cybersecurity Essentials, Charles J. Brooks, Christopher Grow, Philip Craig and Donald Short, 1st edition, Sybex.
2. Network Security Essentials, William Stallings, 6th edition, Pearson Education, 2018.

BTCT3603e SOFTWARE REQUIREMENTS MANAGEMENT

L	T	P	C
3	0	0	3

Course Description:

This course will involve building models of both software engineering processes and products, concerning both functional and non-functional goals, requirements, and specifications. It will provide students with the skills needed for software requirements engineering, as well as a foundation that can be used to systematically establish, define, and manage the requirements for large, complex, and changing software-intensive systems, from technical, organizational, and management perspectives.

Course Objectives:

1. To understand the need of requirements for engineering large scale systems.
2. To specify functional requirements and non-functional requirements.
3. To analysis given problem-scenarios.
4. To analyse functional requirements and nonfunctional requirements
5. To apply requirement management tools.

UNIT I **9 Hrs**

Requirements Management and Problem Analysis: The Requirements Problem - The Root Causes of Project Success and Failure. Introduction to Requirements Management - The Road Map. The Requirements and the Software Lifecycle - Traditional Software Process models - The Iterative approach, Requirements in the Iterative Approach. The five steps in Problem Analysis - Discussion on a Case Study.

UNIT II **9 Hrs**

Business Modeling and Systems Engineering: Business Modeling - The Purpose of Business Modeling, Using Software Engineering Techniques for Business Modeling, From the Business Model to the Systems Model. Systems Engineering of Software intensive systems - Requirements Allocation in Systems Engineering - The Case study in System Engineering.

UNIT III **9 Hrs**

Requirements Gathering Techniques: The Challenge of Requirements Elicitation - Barriers to Elicitation - The Features of a Product or System - Stakeholder and User Needs, Features. Interviewing - Requirements Workshops - Brainstorming and Idea Reduction – Storyboarding- Technical Methods for Specifying Requirements- Finite State Machines - Decision Tables and Decision Trees - Activity Diagrams- Entity-Relationship Models.

UNIT IV **9 Hrs**

Defining the System: A Use case Primer - Organizing Requirements Information - Organizing Requirements of Complex Hardware and Software Systems, Organizing Requirements for Product Families. The Vision Document. Product Management - The Role of Product Champion - Primary Activities for a Product Manager - Supporting Activities. Establishing Project Scope - The Problem of Project Scope - The Requirements Baseline Setting.

UNIT V **9 Hrs**

Refining the System Definition: Software Requirements - Refining the Use Cases - How Use Cases Evolve- The Scope of Use case- Extending Use Case- Developing the Supplementary Specification.- Building the Right System- From Use Cases to Implementation - Mapping Requirements to Design and code – From Use Cases to Test Cases- Tracing Requirements - The Traceability Relationship - Using Traceability Tool.

Course Outcomes:

1. Understand the importance of software process models and requirements management.
2. Understand business modeling and systems engineering.
3. Recognize the various strategies of requirement elicitation process and appreciate the challenges of requirement elicitation.
4. Specify functional requirements, nonfunctional requirement and design constraints.
5. Able to use requirement management tools.

Text Books:

1. Dean Leffingwell, Don Widrig, "Managing Software Requirements: A Use Case Approach", Pearson Higher Education, 2nd Edition, 2013.

Reference Books:

1. Klaus Pohl, ―Requirements Engineering - Fundamentals, Principles and Techniques, Springer - Verlag Berlin Heidelberg 2010.
2. Karl Wiegers, Joy Beatty, "Software Requirements", Addison - Wesley Professional,3rd edition, 2013.
3. Suzanne Robertson, James Robertson, "Mastering the Requirements Process: Getting Requirements Right", Addison - Wesley Professional; 3rd edition, 2012.
4. Aurum, Aybüke, Wohlin, Claes (Editors), "Engineering and Managing Software Requirements", Springer - Verlag Berlin Heidelberg, 2005.
5. Ian Sommerville, Pete Sawyer, "Requirements Engineering: A Good Practice Guide," Wiley, 2009.

BTCL3503 **CLOUD COMPUTING LAB** **L T P C**
0 0 2 1

Course Description:
Cloud Computing allows us to create, configure, and customize the business applications online. A cloud application, or cloud app, is a software program where cloud-based and local components work together. This model relies on remote servers for processing logic that is accessed through a web browser with a continual internet connection. Hadoop is an open-source framework that allows to store and process big data in a distributed environment across clusters of computers using simple programming models. It is designed to scale up from single servers to thousands of machines, each offering local computation and storage.

Course Objectives:
The students will try to learn:
1. How to run virtual machines of different configurations.
2. The application of Big data using Hadoop under a cloud environment.
3. Exposed to tool kits for cloud environment.
4. How to develop web services / Applications in a cloud framework.
5. Learn to deploy and manage applications on popular cloud platforms like AWS, Google App Engine, and Windows Azure.

TASK-1: VIRTUALIZATION
Install Oracle Virtual box and create two VM son your laptop.

TASK-2: PROGRAMMING IN VM
Install Turbo C in guest OS and execute C program.

TASK-3: COMMUNICATION AMONG VMs
Test ping command to test the communication between the guest OS and Host OS Find a procedure to transfer the files from one virtual machine to another virtual machine.

TASK–4: GOOGLE APP ENGINE
Install Google App Engine. Create hello world app and other simple web applications using python / java.

TASK-5: GOOGLE APP ENGINE LAUNCHER
Use Google App Engine (GAE) launcher to launch the web applications.

TASK-6: CLOUDSIM
Simulate a cloud scenario using Cloud Sim and run a scheduling algorithm that is not present in Cloud Sim.
.
TASK-7: TRYSTACK
Demonstrate a procedure to launch virtual machine using try stack (Online Open stack Demo Version).

TASK 8: DATA INTENSIVE PROGRAMMING
Install Hadoop single node cluster and run simple applications like word count.

TASK-9: AWS – EC2

Establish an AWS account. Use the AWS Management Console to launch an EC2 instance and connect to it.

TASK-10: AWS, SIMPLE QUEUE SERVICE(SQS)
Design a protocol and use Simple Queue Service (SQS) to implement the barrier synchronization after the first phase.

TASK-11: CSP MONITOR
Use the Zoo keeper to implement the coordination model in Problem 10.

TASK-12: CLOUD DEPLOYMENT
Demonstrate authentication and JWT Cloud Deployment Using Docker.

TASK-13: CLOUD PROGRAMMING
Develop a Guest book Application using Google App Engine.

TASK-14: WINDOWS AZURE
Develop a Windows Azure HelloWorld application.

Course Outcomes:
The students able to
1. Understand how to run virtual machines of different configuration.
2. Apply the Big data using Hadoop under cloud environment.
3. Understand the tool kits for cloud environment.
4. Know how to develop web services / Applications in cloud framework.
5. Demonstrate the ability to deploy, manage, and coordinate cloud-based applications and services on platforms such as AWS, Google App Engine, and Windows Azure.

Text Books:

1. Dan Marinescu, "Cloud Computing: Theory and Practice", MK Publishers, 2nd Edition, 2017.
2. Kai Hwang, Jack Dongarra, Geoffrey Fox, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", MK Publishers, 1st Edition, 2013.

Reference Books:

1. Anthony T. Velte, Toby J. Velte, Robert Else Peter, "Cloud Computing: A Practical Approach", McGraw-Hill, 1st Edition, 2009.
2. Arshdeep Bahga, Vijay Madisetti, "Cloud Computing A Hands-on Approach", Universities Publications, 1stEdition, 2013.

Web References:

1. http://www.howtogeek.com/196060/beginner-geek-how-to-create-and-use-virtual-machines/
2. http://www.tutorialspoint.com/hadoop/
3. http://www.tutorialspoint.com/zookeeper/
4. https://cloud.google.com/appengine/docs/java/gettingstarted/creating-guestbook

ock BTCL3504 ANDROID APPLICATION DEVELOPMENT LAB L T P C

0 0 2 1

Course Description:
This course introduces the fundamental components and structure of mobile application frameworks, emphasizing key design concepts, GUI components, layout management, event handling, and the use of device features such as GPS and SD card storage. Through practical experiments, students will learn to build native applications, implement graphical interfaces, interact with databases, utilize RSS feeds, and handle multi-threading. By the end of the course, students will gain the skills to develop, deploy, and optimize mobile applications for real-world use, leveraging the capabilities of modern mobile devices.

Course Objectives:
1. Know the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
2. Understand how to work with various mobile application development frameworks
3. Learn the basic and important design concepts and issues of development of mobile applications.
4. Understand the capabilities and limitations of mobile devices.
5. Get use of layout managers and event listeners.

LIST OF EXPERIMENTS:
1. Develop an application that uses GUI components, Font and Colors
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of databases.
6. Develop an application that makes use of RSS Feed.
7. Implement an application that implements Multi-threading.
8. Develop a native application that uses GPS location information.
9. Implement an application that writes data to the SD card.
10. Implement an application that creates an alert upon receiving a message.

Course Outcomes:
After the completion of this course the student be able to
1. Design and implement various mobile applications using emulators.
2. Deploy applications to hand-held devices
3. Deploy applications to make use of RSS feed.
4. Deploy applications to make use of GUI components and font colors.
5. Deploy applications to make use of layout managers and event listeners.

Textbooks

1. B. Phillips, C. Stewart, and K. Marsicano, *Android Programming: The Big Nerd Ranch Guide*. Atlanta, GA, USA: Big Nerd Ranch Guides, 2017.
2. R. Meier, *Professional Android*. Indianapolis, IN, USA: Wrox, 2023.
3. D. Griffiths and D. Griffiths, *Head First Android Development: A Brain-Friendly Guide*. Sebastopol, CA, USA: O'Reilly Media, 2017.

Reference Books

1. M. Burton, *Android Application Development for Dummies*. Hoboken, NJ, USA: Wiley, 2012.
2. M. Gargenta, *Learning Android*. Sebastopol, CA, USA: O'Reilly Media, 2011.
3. B. Harwani, *Android Programming Unleashed*. Indianapolis, IN, USA: Sams Publishing, 2012.

VII SEMESTER

BTCT4501 **BIG DATA ANALYTICS** **L T P C**

3 0 0 3

Course Description:

The course is designed to provide the complete insights about Big Data Analytics. The Course mainly focus on various Big Data Eco systems like Hadoop, Spark, PIC, HIVE, HBASE, Kafka, etc. This course also discusses about different algorithm in focus with Big Data Applications.

Course Objectives:

The following are the course objectives,

1. To understand the fundamental characteristics and best practices of Big Data Analytics.
2. To understand the concept of Hadoop Ecosystem and its associated components in the Hadoop Framework.
3. To Analyze the essential characteristics of HBASE and Kafka.
4. To Apply the key features of Apache Spark in developing and executing Big Data Applications.
5. Examine the algorithms for Big Data Applications.

UNIT I **9 Hrs**

Introduction to Big Data: Introduction to Big Data: Big Data and Business case – Building the Big Data Team - Big Data Big Data Enabling Technologies: Sources-Nuts and Bolts of Big Data- Big Data Security - Compliance - auditing and protection-Evolution of Big Data-Best practices for Big Data Analytics-Big Data characteristics- Volume - Veracity - Velocity - Variety- Structure of Big Data.

UNIT II **9 Hrs**

Hadoop Distributed File System And Map Reduce Programming: Introduction to Hadoop - Hadoop Stack for Big Data - Hadoop Distributed File System (HDFS) - Hadoop MapReduce 1.0 - Hadoop MapReduce 2.0 -Advanced Features of Hadoop MapReduce 2.0 - MapReduce Examples.

Case study: Word Count Example, Healthcare Data Analysis using Map Reduce Programming.

UNIT III **9 Hrs**

Working With Pig and Hive: Introduction – installation and execution – PIG Data Model – PIG Latin – Input, Output- Relational Operators – User Defined Functions – Join Implementations – Integrating Pig with Legacy Code and Map Reduce –Developing and Testing Pig Latin Scripts.

Introduction – Data Types and File Formats – Databases in Hive – HiveQL: Data Definition – Data Manipulation – Queries – Views – Indexes – Schema Design.

UNIT IV **8 Hrs**

Hbase and Kafka: Design of HBase-Spark Streaming and Sliding Window Analytics - Sliding Window Analytics-Introduction to Kafka

UNIT V **10 Hrs**

Big Data Analytics Using Spark: Introduction to Spark - Parallel Programming with Spark - Spark Built-in Libraries Design of Key-Value Stores - Data Placement Strategies - CAP Theorem- Consistency Solutions - Design of Zookeeper - CQL (Cassandra Query Language) - Big Data Predictive Analytics - PageRank Algorithm in Big Data - Spark GraphX & Graph Analytics. Case Study: Flight Data Analysis using Spark GraphX.

Course Outcomes:

On completion of the course, student will be able to:

1. Explain fundamental characteristics and best practices of Big Data Analytics.
2. Define concept of Hadoop Ecosystem and its associated components in the Hadoop Framework.
3. Analyze the key features of Apache Spark in developing and executing Big Data Applications.
4. Analyze the essential characteristics of HBASE and Kafka.
5. Examine the algorithms for Big Data Applications.

Text Books:

1. Ohlhorst, Frank J. Big data analytics: turning big data into big money. Vol. 65. John Wiley & Sons, 2012.
2. Tom White, “HADOOP: The definitive Guide”, O Reilly 2012.
3. Guller, Mohammed. Big data analytics with Spark: A practitioner's guide to using Spark for large scale data analysis. Apress, 2015.

Reference Books:

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, ISBN: 9788126551071, 2015.
2. Tom Plunkett, Brian Macdonald et al, “Oracle Big Data Handbook”, Oracle Press, 2014.
3. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Bill Franks, John Wiley &Sons, 2012.

BTCT4502	INTERNET OF THINGS	L T P C
		3 0 0 3

Course Description:

Internet of Things is a course that deals with the study of how devices are connected and how it helps to stay connected over the Internet. The course teaches individuals how the Internet of Things is helpful in our daily lives and how to stay connected over the Internet.

Course Objectives:

The objective of this course is to make students to:

1. To impart knowledge on the infrastructure, sensor technologies
2. To gain knowledge of networking technologies of Internet of Things.
3. To analyse, design and develop solutions for Internet of Things.
4. To explore the real-life aspects of Internet of Things.
5. To provide exposure to the IoT data processing and storage

UNIT I **9 Hrs**

IoT Fundamentals: Definition and Characteristics of Internet of Things (IoT) - Challenges and Issues - Physical Design of IoT - Logical Design of IoT - IoT Functional Blocks.

IoT Communication Architectures and Protocols : Control Units – Communication modules – Bluetooth – Zigbee – WiFi – GPS - IoT Protocols (IPv6, 6LoWPAN, RPL, CoAP) – MQTT - Wired Communication - Power Sources.

UNIT II **9 Hrs**

Technologies Behind IoT : Four pillars of IoT paradigm: RFID, Wireless Sensor Networks, Supervisory Control and Data Acquisition (SCADA) - M2M - IoT Enabling Technologies: Bigdata Analytics, Cloud Computing, Embedded Systems

UNIT III **9 Hrs**

Resource Management in IoT: Network Configuration Protocol, Open vSwitch Database Management Protocol - Routing and Protocols: Collection Tree, LOADng.

UNIT IV **9 Hrs**

IoT to Web of Things: Scope of Web of Things (WoT) – IoT Data Management: Set up cloud environment, Cloud access from sensors, Data Analytics Platforms for IOT- Resource Identification: Richardson Maturity Model - REST API.

UNIT V **9 Hrs**

IoT Data Processing and Storage: Time Series Data and their characteristics, time series databases, basic time series analytics, data summarization and sketching, dealing with noisy and missing data, anomaly and outlier detection.

Course Outcomes:

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

1. Understand the fundamentals of IoT, its applications.
2. Understand and analyze various tools for design of IoT system.
3. Analyze the Raspberry Pi tool and its features.
4. Deploy an IoT application and connect to the cloud.
5. Build smart devices using IoT

Text Books:

1. Samuel Greengard, The Internet of Things, MIT Press Essential Knowledge Series, 2015.
2. Sharma, L., & Carpenter, M. (Eds.). (2022). Computer Vision and Internet of Things: Technologies and Applications. CRC Press.

Reference Books:

1. Ben Fry, Visualizing Data-Exploring and Explaining Data with the Processing Environment, O'Reilly Media, 2008.
2. Andrew K Dennis, Raspberry Pi Computer Architecture Essentials, Packt Publishing, 2016
3. Mangla, M., Kumar, A., Mehta, V., Bhushan, M., & Mohanty, S. N. (Eds.). (2022). Real-life applications of the Internet of Things: Challenges, applications, and advances.

Program Elective – IV

BTCT4601a AUGMENTED & VIRTUAL REALITY

L	T	P	C
3	0	0	3

Course Description:

This course offers an in-depth exploration of immersive technologies. Beginning with an introduction to Augmented Reality (AR) and its distinctions from Virtual Reality (VR) and Mixed Reality (MR), students gain insights into AR systems, methods, and visualization techniques. The course progresses to VR systems, covering architecture, hardware components, and input/output devices. Stereoscopic Vision and Haptic Rendering are examined, elucidating human visual fundamentals, depth cues, and haptic sense algorithms. VR software development challenges and architectures, including game engines and SDKs, are explored. The course concludes with 3D interaction techniques, focusing on manipulation tasks and input devices for immersive user experiences.

Course Objectives:

1. To gain knowledge of historical and modern overviews and perspectives on virtual rea lity.
2. To learn the fundamentals of sensation, perception, and perceptual training.
3. To have the scientific, technical, and engineering aspects of augmented and virtual rea lity systems.
4. To learn the Evaluation of virtual reality from the lens of design.
5. To learn the technology of augmented reality and implement it to have practical knowl edge.

UNIT I **9 Hrs**

Introduction : Introduction to Augmented-Virtual and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR ,VR and MR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality.

UNIT II **9 Hrs**

VR systems : VR as a discipline, Basic features of VR systems, Architecture of VR systems, VR hardware : VR input hardware: tracking systems, motion capture systems, data gloves, VR output hardware: visual displays.

UNIT III **9 Hrs**

Stereoscopic Vision & Haptic rendering : Fundamentals of the human visual system, Depth cues, Stereopsis, Retinal, disparity, Haptic sense, Haptic devices, Algorithms for haptic rendering and parallax, Synthesis of stereo pairs, Pipeline for stereo images.

UNIT IV **9 Hrs**

VR software development : Challenges in VR software development, Master/slave and Client/server architectures, Cluster rendering, Game Engines and available sdk to develop VR applications for different hardware (HTC VIVE, Oculus, Google VR).

UNIT V **9 Hrs**

3D interaction techniques: 3D Manipulation tasks, Manipulation Techniques and Input Devices, Interaction Techniques for 3D Manipulation.

Course Outcomes:

1. Identify, examine, and develop software that reflects fundamental techniques for the des ign and deployment of VR and AR experiences.
2. Describe how VR and AR systems work.
3. Choose, develop, explain, and defend the use of particular designs for AR and VR expe riences.
4. Evaluate the benefits and drawbacks of specific AR and VR techniques on the human b ody.
5. Identify and examine the state-of-the art AR and VR design problems and solutions from the industry and academia.

Text Books:

1. 1.George Mather, Foundations of Sensation and Perception:Psychology Press; 2 edition, 2009
2. The VR Book: Human-Centered Design for Virtual Reality, by Jason Jerald
3. Learning Virtual Reality by Tony Parisi, O' Reilly
4. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition.Wiley-IEEE Press, 2003/2006.
5. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

Reference Book:

1. Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Application s, Foundations of Effective Design, Morgan Kaufmann, 2009.

BTCT4601b **BLOCKCHAIN TECHNOLOGY** **L T P C**

3 0 0 3

Course Description:

This course provides an in-depth understanding of blockchain technology, its architecture, and its applications. Students will explore the fundamentals of blockchain, including decentralized networks, cryptographic principles, consensus algorithms, and smart contracts. The course covers various blockchain platforms, their use cases across different industries, and the challenges and future trends in blockchain technology. Emphasis is placed on theoretical knowledge and the analysis of real-world applications and case studies to provide students with a comprehensive understanding of blockchain technology and its potential impact.

Course Objectives:

The students will try to learn:

1. To learn the foundational concepts of blockchain and cryptographic primitives.
2. To analyse different blockchain architectures and their categories.
3. To understand emerging cryptocurrencies and consensus mechanisms.
4. To explore advanced blockchain protocols and zero-knowledge proofs.
5. To apply blockchain technology in areas beyond cryptocurrencies, such as cybersecurity and micropayments.

UNIT I Introduction to Blockchain and Crypto primitives **9 Hrs**

Blockchain, Distributed Ledgers - Cryptographic basics for cryptocurrency - Hashing, signature schemes, encryption schemes and elliptic curve cryptography - CAP theorem and blockchain - Categories of Blockchains: Public, Private blockchains, Permissioned Ledger, Tokenized blockchains, Tokenless blockchains, Sidechains. Hardware and software requirements of Block chain

UNIT II Emerging Cryptocurrencies **9 Hrs**

Distributed identity: Public and private keys, Digital identification and wallets; Decentralized network - Distributed ledger: Permissioning framework, Blockchain data structure - Double spending; Network consensus -Sybil attacks, Block rewards and miners, Difficulty under competition, Forks and consensus chain, The 51% attack, Confirmations and finality - Proof of Work (PoW), Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS) .

UNIT III Zero Knowledge proofs and protocols in Blockchain **9 Hrs**

Pseudo-anonymity vs. anonymity: Zero Knowledge proofs and protocols in Blockchain - Succinct non interactive argument for Knowledge (SNARK) - pairing on Elliptic curves – Zcash.

UNIT IV Building Cryptocurrency and Smart Contracts **9 Hrs**

Link between Blockchain and Cryptocurrencies, Mechanics of Bitcoin: Bitcoin transactions, Bitcoin Scripts. Ethereum - Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Solidity –Smart Contracts – some attacks on smart contracts.

UNIT V Beyond Crptocurrency **9 Hrs**

Applications of Blockchain in cybersecurity, Smart property, Efficient micropayments, Coupling Transactions and Payment(Interdependent Transactions), Escrow transactions, Auctions and Markets.

Course Outcomes:

After Completion of the course the student will be able to

1. Understand the necessary cryptographic background
2. Familiarize the mechanism of Blockchain and Cryptocurrency
3. Analyze the protocols used in Blockchain technology
4. Examine the major developments related to blockchain and cryptocurrencies.
5. Identify the applicability of blockchains beyond cryptocurrency.

Text Books:

1. Treccani, A., Lipton, A. (2021). Blockchain And Distributed Ledgers: Mathematics, Technology, And Economics - First Edition, Singapore: World Scientific Publishing.
2. Bashir, I. (2020). Mastering Blockchain: A Deep Dive Into Distributed Ledgers, Consensus Protocols, Smart Contracts, DApps, Cryptocurrencies, Ethereum, and More - Third Edition, United Kingdom: Packt Publishing.

References Books:

1. Goldfeder, S., Bonneau, J., Miller, A., Felten, E., Narayanan, A. (2016). Bitcoin and Cryptocurrency Technologies - First Edition, Princeton University Press.
2. Wattenhofer, R. (2019). Blockchain Science: Distributed Ledger Technology – Third Edition, United States: Independently Published.

BTCT4601c NATURAL LANGUAGE PROCESSING

	L	T	P	C
	3	**0**	**0**	**3**

Course Description:

This course is designed to introduce students to the fundamental concepts and ideas in natural language processing (NLP), and to get them up to speed with current research in the area. It develops an in-depth understanding of both the algorithms available for the processing of linguistic information and the underlying computational properties of natural languages. Word level, syntactic, and semantic processing from both a linguistic and an algorithmic perspective are considered.

Course Objectives:

1. Explain and apply fundamental algorithms and techniques in the area of natural language processing (NLP)
2. Discuss approaches to syntax and semantics in NLP.
3. Examine current methods for statistical approaches to machine translation.
4. Teach machine learning techniques used in NLP.
5. To explore the concept of Machine Translation and multilingual Information Retrieval systems.

UNIT I **9 Hrs**

Introduction to Natural language: The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English Syntax.

UNIT II **9 Hrs**

Grammars and Parsing: Grammars and Parsing- Top-Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks, Bayes Rule, Shannon game, Entropy and Cross Entropy.

UNIT III **9 Hrs**

Grammars for Natural Language: Grammars for Natural Language, Movement Phenomenon in Language, Handling questions in Context Free Grammars, Hold Mechanisms in ATNs, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.

UNIT IV **9 Hrs**

Semantic Interpretation:

Semantic & Logical form, Word senses & ambiguity, The basic logical form language, Encoding ambiguity in the logical Form, Verbs & States in logical form, Thematic roles, Speech acts &embedded sentences, Defining semantics structure model theory.

Language Modelling

Introduction, n-Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language-Specific Modelling Problems, Multilingual and Cross lingual Language Modelling.

UNIT V: **9 Hrs**

Machine Translation

Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches, Current Status. Anusaraka or Language Accessor: Background, Cutting the Gordian Knot, The Problem, Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusarsaka Output, Language Bridges.

Multilingual Information Retrieval

Introduction, Document Pre-processing, Monolingual Information Retrieval, CLIR, MLIR, Evaluation in Information Retrieval, Tools, Software and Resources.

Course Outcomes:

After completion of the course, students will be able to

1. Understand the various NLP Applications and Organization of Natural language, able to learn and implement realistic applications using Python.
2. Apply the various Parsing techniques, Bayes Rule, Shannon game, Entropy and Cross Entropy.
3. Understand the fundamentals of CFG and parsers and mechanisms in ATN's.
4. Apply Semantic Interpretation and Language Modelling.
5. Apply the concept of Machine Translation and multilingual Information Retrieval systems and Automatic Summarization.

Text Books:

1. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.
2. Multilingual Natural Language Processing Applications: From Theory To Practice-Daniel M.Bikel and Imed Zitouni, Pearson Publications.
3. Natural Language Processing, A paninian perspective, Akshar Bharathi, Vineet Chaitanya, Prentice–Hall of India.

Reference Books:

1. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
2. Jurafsky,, Dan and Martin, James, Speech and Language Processing, 2nd Edition, Prentice Hall, 2008.
3. Manning, Christopher and Henrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

BTCT4601d **NO SQL DATABASES** **L T P C**
3 0 0 3

Course Description:

The widespread emergence of big data storage needs has driven the development and adoption of a new class of non-relational databases commonly referred to as NoSQL databases. This course will explore the origins of NoSQL databases and the characteristics that distinguish them from traditional relational database management systems. Core concepts of NoSQL databases will be presented.

Course Objectives:

The students should be able to,

1. Explain different types of NoSQL Databases
2. Identify the challenges of NoSQL Approach
3. Outline the features of key/Value databases and Illustrate the E-commerce applications and different aggregate structures.
4. Define column oriented NoSql Database and the Column-Family Data Store Features, summarize Event Logging, Content Management Systems.
5. Apply Nosql Development tools with suitable usecase.

UNIT I **9 Hrs**

Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points.

UNIT II **9 Hrs**

Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding, MapReduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

UNIT III **9 Hrs**

NoSQL Key/Value databases using MongoDB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.

UNIT IV **9 Hrs**

Column- oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use

Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.

UNIT V **9 Hrs**

NoSQL Key/Value databases using Riak, Key-Value Databases,Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data,Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets. Graph NoSQL databases using Neo4,NoSQL database development tools and programming languages, Graph Databases, Graph Database. Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases.

Course Outcomes:

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

1. Explain and compare different types of NoSQL Databases
2. Compare and contrast RDBMS with different NoSQL databases.
3. Demonstrate the detailed architecture and performance tune of Document-oriented NoSQLdatabases.
4. Explain performance tune of Key-Value Pair NoSQL databases.
5. Apply Nosql development tools on different types of NoSQL Databases.

Text Books:

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition ,2019.

Web References:

1. https://www.ibm.com/cloud/learn/nosql-databases
2. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp
3. https://www.geeksforgeeks.org/introduction-to-nosql/
4. https://www.javatpoint.com/nosql-databa

BTCT4601e	**SOFT COMPUTING**	**L T P C** **3 0 0 3**

Course Description:
Soft computing is an emerging approach to computing which parallel the remarkable ability of the human mind to reason and learn in an environment of uncertainty and imprecision. Soft computing is based on some biological inspired methodologies such as genetics, evolution, ant's behaviors, particles swarming, human nervous systems, etc. Now, soft computing is the only solution when we don't have any mathematical modeling of problem solving (i.e., algorithm), need a solution to a complex problem in real time, easy to adapt with changed scenario and can be implemented with parallel computing. It has enormous applications in many application areas such as medical diagnosis, computer vision, hand written character recondition, pattern recognition, machine intelligence, weather forecasting, network optimization, VLSI design, etc.

Course Objectives:
The main objective of the Soft Computing Techniques to Improve Data Analysis Solutions is to strengthen the dialogue between the statistics and soft computing research communities to cross-pollinate both fields and generate mutual improvement activities.
Soft Computing is a consortium of methodologies collectively providing concepts and techniques for designing intelligent systems.

UNIT I **9 Hrs**
Introduction: What is Soft Computing? Difference between Hard and Soft computing, Requirement of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing.

UNIT II **9 Hrs**
Neural Networks: What is Neural Network, Learning rules and various activation functions, Single layer Perceptrons, Back Propagation networks, Architecture of Backpropagation(BP) Networks, Backpropagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications

UNIT III **9 Hrs**
Fuzzy Systems: Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Minmax Composition, Defuzzification Method, Fuzzy Logic, Fuzzy Rule based systems, Predicate logic, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification.

UNIT IV **9 Hrs**
Genetic Algorithm: History of Genetic Algorithms (GA), Working Principle, Various Encoding methods, Fitness function, GA Operators- Reproduction, Crossover, Mutation, Convergence of GA, Bit wise operation in GA, Multi-level Optimization.

UNIT V **9 Hrs**
Hybrid Systems: Sequential Hybrid Systems, Auxiliary Hybrid Systems, Embedded Hybrid Systems, Neuro-Fuzzy Hybrid Systems, Neuro-Genetic Hybrid Systems, Fuzzy-Genetic Hybrid Systems.

Course Outcomes:
1. Apply diverse soft computing principles in real-world scenarios.

2. Apply fuzzy rules and logical thinking in constructing decision-making and expert systems.
3. Select and formulate an appropriate neural network for real-time challenges.
4. Implement optimization methods and the genetic algorithm.
5. Evaluate different hybrid soft computing techniques and use them in real-time challenges.

Text Books:

1. S. N. Sivanandam and S. N.Deepa, Principles of soft computing – John Wiley & Sons, 2007.
2. Timothy J. Ross, Fuzzy Logic with engineering applications , John Wiley & Sons, 2016.

Reference Books

1. N. K. Sinha and M. M. Gupta, Soft Computing & Intelligent Systems: Theory & Applications-Academic Press /Elsevier. 2009.
2. Simon Haykin, Neural Network- A Comprehensive Foundation- Prentice Hall International, Inc.1998 3. R. Eberhart and Y. Shi, Computational Intelligence: Concepts to Implementation, Morgan Kaufman/Elsevier, 2007.
3. Driankov D., Hellendoorn H. and Reinfrank M., An Introduction to Fuzzy ControlNarosa Pub., 2001. 5. Bart Kosko, Neural Network and Fuzzy Systems- Prentice Hall, Inc., Englewood Cliffs, 1992
4. Goldberg D.E., Genetic Algorithms in Search, Optimization, and Machine LearningAddison Wesley, 1989.

Program Elective – V

BTCT4602a **MOBILE COMPUTING** **L T P C**

3 0 0 3

Course Description:

This course explores various challenges and opportunities of mobile computing, including topics such as wireless network protocols and standards, location awareness, sensing, user interfaces, application development, and security/privacy concerns.

Course Objectives:

The objective of this course is to make students to:

1. To learn about various wireless & cellular communication networks and various telephone and satellite networks.
2. To build knowledge on various Adhoc and sensor networks routing protocol
3. To gain knowledge of energy efficient protocol.
2. To build skills in working with Cognitive radio networks and recent telecommunication networks
3. To design and development of various network protocol using simulation tools.

UNIT I **9 Hrs**

Introduction: Overview of wireless and mobile infrastructure; Preliminary concepts on cellular architecture; Design objectives and performance issues; Radio resource management and interface; Propagation and path loss models; Channel interference and frequency reuse; Cell splitting; Channel assignment strategies; Overview of generations: - 1G to 5G

UNIT II **9 Hrs**

Location and handoff management: Introduction to location management (HLR and VLR); Mobility models characterizing individual node movement (Random walk, Fluid flow, Markovian, Activity-based)

UNIT III **9 Hrs**

Wireless transmission fundamentals: Introduction to narrow and wideband systems; Spread spectrum; Frequency hopping; Introduction to MIMO; MIMO Channel Capacity and diversity gain; Introduction to OFDM; MIMO-OFDM system; Multiple access control (FDMA, TDMA, CDMA, SDMA); Wireless local area network; Wireless personal area network (Bluetooth and zigbee).

UNIT IV **9 Hrs**

Mobile Ad-hoc networks: Characteristics and applications; Coverage and connectivity problems; Routing in MANETs.

UNIT V **9 Hrs**

Cognitive radio networks: Fixed and dynamic spectrum access; Direct and indirect spectrum sensing; Spectrum sharing; Interoperability and co-existence issues; Applications of cognitive radio networks.

Course Outcomes:

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

1. Understand the working principles of mobile networks and Contrast different types of telecommunication networks.
2. Study on location, handoff management and wireless fundamentals.
3. Study on MANET and Sensor networks including architecture, routing and power optimization technique.
4. Study on cognitive ratio networks and its applications.
5. Assess the recent telecommunication networks, resource management

Text Books:

1. Jochen Schiller, Mobile Communications. Pearson Education, 2009.
2. Andrea Goldsmith, Wireless Communications. Cambridge University Press, 2012.

Reference Books:

1. Ivan Stojmenovic, Handbook of Wireless Networking and Mobile Computing, Wiley, 2002.
2. Ezio Biglieri, Andrea J. Goldsmith, Larry J. Greenstein, Narayan Mandayam and H. Vincent Poor, Principles of Cognitive Radio. Cambridge University Press, 2012.
3. Shwetha, V., & Yashas, G. (2022). Extended reality: the future of mobile computing. International Research Journal of Modernization in Engineering Technology and Science, 4(7), 1521-1524.

BTCT4602b SECURED SOFTWARE ENGINEERING L T P C
3 0 0 3

Course Description:
Secure software engineering is the practice of developing software that can continue to function normally even when attacked by malicious actors. This course covers process models, requirements engineering, architectural designs, threat modelling, containerized development and software security economics.

Course Objectives:
1. Understanding various system process models and build a secure environment.
2. To learn requirements of the engineering to build analysis and design models.
3. Apply vulnerability analysis into architecture and design process, access controlled and clean environment to build software, target environment hardening and secure application deployment.
4. To learn the need for software security and memory based attacks.
5. To familiarize with containerization for software development and also focus on security testing of software and software security economics.

UNIT I 9 Hrs
Process Models–Waterfall, incremental, evolutionary, concurrent, Agile Programming-Introduction, Flavors of Agile Development, Agile Manifesto, Refactoring Techniques, Limitations of the Agile Process, Agile Modeling with XP, Scrum Methodology. How sprint works: Sprint Planning, Daily scrum meeting, updating sprint backlog, Burn down chart, sprint review, sprint retrospective. Scrum Metrics- velocity, burn down, defects carried over. Secure development and build environment.

UNIT II 9 Hrs
Requirements Engineering: Tasks Initiation-Elicitation-Developing Use Cases-Building the analysis Model-Negotiation- Validation Requirements Modelling - building the analysis model, Scenario based methods, UML Models, Data Models. Design engineering Design concepts, Design models, software architecture, architectural styles and patterns.

UNIT III 9 Hrs
Architectural design: styles and patterns, architectural design, Refining architecture to components. Performing user interface Design-Golden Rules-User Interface Analysis and Design- Interface Analysis-Interface design steps. Threat Modeling –STRIDE, Information flow and vulnerability model to build security into life cycle phase of software (and hardware) components, Vulnerability analysis into architecture and design process, Access-controlled and clean environment to build software, Target environment hardening and secure application deployment, Attack trees.

UNIT IV 9 Hrs
Need of Software Security and Low-Level Attacks: Software Assurance and Software Security – Threats to software security – Sources of software insecurity – Benefits of Detecting Software Security – Properties of Secure Software – Memory Based Attacks: Low-Level Attacks Against Heap and Stack – Defense against Memory-Based Attacks

UNIT V 9 Hrs
Containerized development: Docker, Kubernets, Continuous Integration and Continuous Delivery (CI/CD). Security testing of software: Unit testing, integration testing, validation and

system testing, fuzzing. Software security economics- logging/ monitoring and physical and operational security aspects. Basics of security governance, risk and compliance.

Course Outcomes:

1. Develop secure system models depending on user requirements.
2. Understand requirements of the engineering.
3. Able to build analysis model and apply threat model for analysing the vulnerabilities in the system.
4. Identify various vulnerabilities related to memory attacks.
5. Understanding software security economics and practices in containerized development and understand the basics of security governance, risk and compliance.

Text Books:

1. Pressman R S, Bruce R. Maxim, Software Engineering - A Practitioner's Approach. Eighth Edition, McGraw-Hill Education, 2019.
2. Julia H. Allen, Software Security Engineering, Pearson Education, 2008.

Reference Books:

1. Crowder JA, Friess S. Agile project management: managing for success. Cham: Springer International Publishing; 2015.
2. Stellman A, Greene J. Learning agile: Understanding scrum, XP, lean, and kanban, O'Reilly Media, Inc.; 2015.
3. Rubin KS. Essential Scrum: a practical guide to the most popular agile process. Addison-Wesley; 2012.
4. S. Garfinkel and L. F. Cranor, Security and Usability: Designing Secure Systems That People Can Use, O'Reilly, 2008.

BTCT4602c	HANDS ON DEVOPS	L T P C
		3 0 0 3

Course Description:

Devops is a combination of practices, tools, and cultural philosophies that help organizations deliver applications and services faster. Devops enables teams to automate and optimize the software development and delivery process. This course is designed to offer deep insights and knowledge into various tools such as Git, Github, Jenkins, Maven, Ansible, creating and modifying pipelines using azure.

Course Objectives:

1. To create and manage repositories on Git.
2. To build a package using maven.
3. To automate deployment using Jenkins pipeline.
4. To understand configuration management of Ansible.
5. To create and modify pipelines using Azure.

UNIT I Introduction to Devops **9 Hrs**

Introduction to Linux, Linux commands, Shell scripting. Devops Essentials - Introduction to Cloud management through AWS, GCP, Azure cloud service providers- Version control systems/Source code management tools: Git and Github. Installation of Git.

UNIT II Compile and Build Using Maven & Gradle **9 Hrs**

Introduction, Installation of build tool: Maven, POM files, Maven Build lifecycle, Build phases(compile build, test, validate, package), Maven Profiles, Maven repositories(local, central, remote), Maven plugins, Maven create and build Artificats, Dependency management, Installation of Gradle, Understand build using Gradle

UNIT III Continuous Integration Using Jenkins **9 Hrs**

Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, creating a Jenkins Build and Jenkins workspace.

UNIT IV Configuration Management Using Ansible **9 Hrs**

Introduction to Ansible, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles, adhoc commands in ansible.

UNIT V Building Devops Pipelines Using Azure **9 Hrs**

Create Github Account, Create Repository, Create Azure Organization, Create a new pipeline, Build a sample code, Modify azure-pipelines. yaml file

Course Outcomes:

1. Understand different actions performed through Version control tools like Git.
2. Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle.
3. Understand Automated Continuous Deployment.
4. Apply configuration management using Ansible.
5. Understand to leverage Cloud-based DevOps tools using Azure DevOps.

Practical Exercises:

1. Create Maven Build pipeline in Azure
2. Run regression tests using Maven Build pipeline in Azure
3. Install Jenkins in Cloud
4. Create CI pipeline using Jenkins
6. Create a CD pipeline in Jenkins and deploy in Cloud
7. Create an Ansible playbook for a simple web application infrastructure
8. Build a simple application using Gradle
9. Install Ansible and configure ansible roles and to write playbooks

Text Books:

1. Roberto Vormittag, “A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert in Easy Step-By-Step Exercises”, Second Edition, Kindle Edition, 2016.
2. Jason Cannon, “Linux for Beginners: An Introduction to the Linux Operating System and Command Line”, Kindle Edition, 2014

Reference Books:

1. Hands-On Azure Devops: Cicd Implementation For Mobile, Hybrid, And Web Applications Using Azure Devops And Microsoft Azure: CICD Implementation for ... DevOps and Microsoft Azure (English Edition) Paperback – 1 January 2020 by Mitesh Soni
2. Jeff Geerling, “Ansible for DevOps: Server and configuration management for humans”, First Edition, 2015.
3. David Johnson, “Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps”, Second Edition, 2016.
4. Mariot Tsitoara, “Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer”, Second Edition, 2019.
5. https://www.jenkins.io/user-handbook.pdf
6. https://maven.apache.org/guides/getting-started/

BTCT4602d	**GAME PROGRAMMING**	**L T P C**
		3 0 0 3

Course Description:

This course covers the fundamentals of video game design, exploring key components such as structure, stages, and team roles. Unit 2 delves into the anatomy of a game designer, concept creation, and considerations for the game world. Unit 3 focuses on the dimensions of the game world, storytelling, character design, and user interface considerations. Unit 4 examines core mechanics, balanced games, and design processes for various game genres, including action, adventure, and online games. The course concludes by emphasizing the implementation of state-of-the-art games in the real world, incorporating principles learned throughout the program. Students gain a comprehensive understanding of game design processes, mechanics, and practical applications.

Course Objectives:

1. To acquire a thorough understanding of the key components and processes involved in video game design.
2. To develop the ability to generate and refine game concepts, considering player roles, genre selection, and target audience.
3. To explore and comprehend the core mechanics of diverse game genres, ensuring a balanced and enjoyable gameplay experience for players.
4. To apply theoretical knowledge to real-world scenarios by implementing state-of-the-art games.
5. To foster critical thinking skills and problem-solving abilities within the context of game design challenges, enabling students to analyse issues, propose innovative solutions, and make informed decisions.

UNIT I Video Games and Design Components: 9 Hrs

Definition of game, Conventional Versus Video Games, How video games Entertainment, Design Components and Processes: The key components of video games, The structure of video games, Stages of video games, Game design team roles, Game design documents

UNIT II The anatomy of a game designer, Game Concepts and its world: 9 Hrs

Getting an Idea, From Idea to game design concept, the player role, choosing a genre, Defining your target audience, progression considerations, types of game machines, Introduction to game world and its purpose.

UNIT III 9 Hrs

Dimensions of Game world. Story telling Character & user interface Design: Story telling play, Goals of character design, The story telling engine, Linear and non linear stories, Emotional limits and Interactive stories, Player centric interface design, Inputs devices, The design process . Game Play and its mechanics: Making game fun, Challenges

UNIT IV 9 Hrs

What are core mechanics, balanced games, Action Games, The level of design process, What are adventure games, Online Games, Design issues of online games, Advantages and disadvantages, Design to appeal to a particular group

UNIT V 9 Hrs

Implement state of art games in the real world with principles of game design.

Course Outcomes:

1. Identify and articulate the key components, stages, and team roles crucial for successful video game design.
2. Generate and refine game concepts, considering player roles, genre selection, and target audience demographics for engaging game experiences.
3. Demonstrate proficiency in understanding and applying core mechanics across diverse game genres, ensuring balanced and enjoyable gameplay.
4. Apply theoretical knowledge by implementing state-of-the-art games, showcasing proficiency in contemporary design principles and industry standards.
5. Exhibit critical thinking and problem-solving abilities, analyzing issues and proposing innovative solutions to enhance the quality and appeal of their game creations.

Text Books:

1. Fundamentals of Game Design Earnest Adams 5 Pearson
2. Game Design: Theory & Practice Richard Rouse II 4, Peachpit.

Reference Book:

1. Game Development Theory & Practice Richard Rouse III 3 Pearson

BTCT4602e **OPERATING SYSTEM SECURITY** **L T P C**
3 0 0 3

Course Description:

This course deals with security concepts and procedures applied in operating systems. Students will examine security concepts that are uniquely implemented into operating systems. It examines theoretical concepts that make the world of security unique.

Course Objectives:

1. To learn fundamentals of operating systems and virtualization.
2. To learn relevant tools to secure operating systems.
3. To learn how to enforcing mandatory access control.
4. To know general information security principles.
5. To learn security in virtual machines.

UNIT I **9 Hrs**

Fundamentals- OS Processes, Synchronization, Memory Management, File Systems, Trusted Operating Systems, Assurance in Trusted Operating Systems, Virtualization Techniques.

UNIT II **9 Hrs**

Secure operating systems- Security goals, Trust model, Threat model, Access Control Fundamentals – Protection system – Lampson's Access Matrix, Mandatory, protection systems, Reference monitor. Multics – Multics system, Multics security, Multics vulnerability analysis.

UNIT III **9 Hrs**

Security in Ordinary OS – Unix, Windows, Verifiable security goals – Information flow, Denning's Lattice model, Bell-Lapadula model, Biba integrity model, Covert channels.

UNIT IV **9 Hrs**

Security Kernels – Secure Communications processor, Securing Commercial OS Secure Capability Systems – Fundamentals, Security, Challenges.

UNIT V **9 Hrs**

Secure Virtual Machine Systems, Case study - Linux kernel, Android, DVL, Solaris Trusted Extensions.

Course Outcomes:

Students who successfully complete this course will be able to:

1. Identify and define key terms related to operating systems.
2. Understand the main concepts of advanced operating systems design.
3. Develop ability to protect operating systems.
4. Improve the security of operating systems from malicious software.
5. To design a secure operating system

Text Book:

1. Andrew S. Tanenbaum, Modern Operating Systems, Fourth Edition, Prentice Hall, 2009.

Reference Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts
2. with Java”, Eighth Edition, Wiley, 2008.
3. Trent Jaeger, Operating System Security, Synthesis Lectures on Information Security,

4. Privacy and Trust, Morgan and Claypool, 2008.
5. C. P. Pfleeger and S. L. Pfleeger, Security in Computing, Prentice Hall Professional, 2003.
6. W. Mauerer, Professional Linux Kernel Architecture, Wiley, 2008.
7. D. P. Bovet and M.Cesati, Understanding the Linux Kernel, Third Edition, O'Reilly Media, Inc., 2005.

BTAL4501 **BIG DATA ANALYTICS LAB** **L T P C**

0 0 2 1

Course Description:

This course mainly focuses in dealing with large-scale data analytics. It deals with cluster computing software tools and programming techniques. This course covers the basic systems and techniques to handle large volumes of data and modern systems on MapReduce such as Hadoop MapReduce and Apache Spark. Students shall explore to implement various algorithms and execute them on cluster environment.

Course Objectives:

1. To understand the basic programming constructs of Hadoop and HDFS.
2. To define and solve Big data problems using Map Reduce Technique in HADOOP.
3. To analyse the Map Reduce programs for Query processing using Hive.
4. To analyse the Apache Spark for Map Reduce programming.
5. To apply Spark API-MLib for machine learning operations.

Task 1:

a) Understanding the Hortonworks Sandbox for Hadoop.
b) Installing Hortonworks Sandbox – Sun virtual box/VMware Player on Windows

Task 2:

Understanding and working with basic HDFS operations such as:

- Starting HDFS services,
- Listing files in HDFS.
- Adding files and directories.
- Retrieving files.
- Deleting files.
- Shutting down the HDFS services.

Task 3:

Understanding and Working with Ambari for provision, manage and monitor a Hadoop cluster, and also to integrate Hadoop with the existing enterprise infrastructure.

Task 4:

Write a java map-reduce program for counting the number of occurrences of each word in a text file.

Task 5:

Write a java map-reduce program for mining healthcare data and perform various analysis on healthcare dataset.

Task 6:

Working with HBase:

Creating, Disabling, Enabling, Describing, Exists, Drop a Table, etc., using HBase Shell

Task 7:
Working with HBase to perform following operation:
Creating, Update, Read, Delete, Scan, Count and Truncate

Task 8: Installation of Apache PySpark and performing basic operations

Task 9: Develop PySpark program with attributes of SparkConf.

Task 10: Working with PySpark SQL and DataFrames.

Task 11: Working with Apache Spark Machine Learning API - MLlib.

Course Outcomes:

1. Understand the basic programming constructs of Hadoop and HDFS.
2. Solve Big data problems using Map Reduce Technique in HADOOP.
3. Analyse the Map Reduce programs for Query processing using Hive.
4. Apply analytics on big data streams using Hadoop Streaming API.
5. Apply Spark API-MLib for machine learning operations.

Reference Books:

1. Ramcharan, K., Sundar, K., Alla, S. (2020). Applied data science using PySpark: Learn the end-to-end predictive model-building cycle Apress.
2. Nudurupati, S. (2021). Essential PySpark for scalable data analytics: A beginner's guide to harnessing the power and ease of PySpark 3 Packt Publishing.
3. Perrin, J. (2020). Spark in action (2nd ed.). (Covers Apache Spark 3 with examples in Java, Python, and Scala) O'Reilly Media Inc.
4. Damji, J., Wenig, B., Das, T., Lee, D. (2020). Learning spark (2nd ed.) O'Reilly Media Inc.
5. Leskovec, J. Rajaraman, A., Ullman, J. (2014). Mining of massive datasets. Cambridge University Press.

Web References:

1. https://archive.nptel.ac.in/courses/106/104/106104189/
2. https://hadoop.apache.org/docs/
3. https://spark.apache.org/docs

BTCL4502	**INTERNET OF THINGS LAB**	**L T P C**
		0 0 2 1

Course Description:
This course provides hands-on practices on IoT using Arduino & Raspberry microcontrollers with various interfaces such as sensors, actuators, mobile app, cloud, social media.

Course Objectives:
1. To understand working principles of IoT devices.
2. To get exposure towards the IoT internals.
3. To understand the concepts of real-world designs, industrial automation and commercial needs for
4. Designing IOT enabled solution.
5. Understand all IOT tools.

List of Experiments:

1. Study on IoT Platform
   a) Getting information and study of IOT microcontrollers (Arduino, Resperrypi)
2. Study on IoT Platform
   a) Getting information about Sensors (IR, temperature, pressure, gas sensor)
   b) Getting information about actuators. (Piezoelectric actuator, pneumatic actuator)
3. Programming with Arduino platform
   a) Installation of Arduino in computer and verifying any errors in connection.
   b) Control LED using Arduino
   c) Traffic Light Control
4. Programming with Arduino platform and Reading from Sensors.
   a) interfacing sensors to Arduino board and getting information from them (any two sensors).
   b) Experiment with both analog and digital sensors.
5. Programming with Resperrypi
   a) Displaying Date on Serial Monitor
   b) Automated Door Opening System
6. Connecting Android Phone with Arduino
   a) Connecting Arduino with Mobile Device Using the Bluetooth Module.
   b) Control any two actuators connected to the development board using Bluetooth.
7. Integrating Ethernet Shield - Read data from sensor and send it to a requesting client using socket communication.
8. Creating Mobile App
   a) Create a mobile app to control an actuator.
   b) Control Electronic Devices from anywhere across the world using Internet & Mobile App.
9. Interfacing Cloud
   a) Push sensor data to cloud - Use Arduino to Upload data from Environmental Sensors to Cloud Server.
   b) Control an actuator through cloud
10. Data analysis and Visualization - Access the data pushed from sensor to cloud and apply any data analytics or visualization services.

Course Outcomes:

Upon completion of this course the students should:

1. Choose the sensors and actuators for an IoT application
2. Select protocols for a specific IoT application
3. Utilize the cloud platform and APIs for IoT application
4. Experiment with embedded boards for creating IoT prototypes
5. Design and develop a solution for a given IoT application

Reference Books:

1. Adrian McEwen, Hakim Cassimally, Designing the Internet of Things, Wiley Publications, 2014.
2. Arshdeep Bahga, Vijay Madisetti, Internet of Things: A Hands-On Approach, Universities Press, 2015.
3. Pethuru Raj, Anupama C. Raman, The Internet of Things, Enabling technologies and usecases, CRC Press. 2017.
4. Matt Richardson & Shawn Wallace, Make:Getting Started with Raspberry Pi, O'Reilly, 3rd Edition.

VIII - Semester

BTCP4502:	**Project Work**	**L T P C** **0 0 24 12**

Annexure I

TAUT2201F COMPUTERS AND AI IN DIGITAL HEALTHCARE L T P C
3 0 0 3

Course Description:

Healthcare systems are rapidly emerging towards digital health, which requires fundamental knowledge of data, data use and digital ecosystems.Health data is vital important for building value-based health care system. Further, digital health data informs decision making, resource management, analytics, reporting, funding, and policy development. Digitalized healthcaresystem refers to specialized components of the new interdisciplinary science known as digital health. In the recent years, Artificial Intelligence (AI) and Machine Learning is transforming various sectors, including medicine. This course covers data and information management, big data, data analytics and visualization, personalization, EHR, health data exchange and standards, database management system, data security, journey of AI applications in medicine, and give you a practical experience in applying AI to solve real-world medical problems.

Course Objectives:

On successful completion of this unit, students should be able to:

1. Explain the importance of data and information management in healthcare, adoption and use of data standards in digital healthcare systems.
2. Identify and describe professional and technical challenges associated with electronic health record (EHR) structural designs and associated systems used within digital health ecosystem.
3. Demonstrate the fundamental of Python programming language and its associated tools for data processing, analysis and visualization the healthcare data.
4. Appraise the fundamentalsof AI and machine learning concepts, essential techniques and relevant tools for Digital Healthcare
5. Apply different AI and Machine Learning algorithms for various healthcare data analysis.

UNIT I 9 Hrs

Clinical Information System

Introduction to clinical information systems – Contemporary issues in healthcare – Workflow and related tools for workflow design – Electronic Health Records (EHR)-Databases – Healthcare IT & portable technology.

UNIT II 9 Hrs

Data and information management in Healthcare System

Introduction to the data-based management system (DBMS), Relational database management (RDBMS), database tables, programming data with structured query language (SQL), NoSQL Databases. Bigdata Overview, Big data technologies for digital health, Importance of Data security and Privacy.

UNIT III 9 Hrs

Python for Healthcare

Introduction, python basics, language syntax, data structures, Python programming fundamentals, working with healthcare data in python.

UNIT IV **9 Hrs**

AI and Digital Healthcare

Overview of AI, Deploying AI in digital health, Benefits of AI in Healthcare, Real-World Applications of AI in Medicine, Role of Natural Language Processing (NLP) in healthcare.

UNIT V **9 Hrs**

Machine Learning

Machine learning overview, Types of Machine Learning, Supervised Learning: Classification and Regression analysis. Unsupervised Learning: basic and advanced clustering techniques. Introduction to Reinforcement algorithms

Case Studies:

1. Exploratory Data Analysis on Diabetes dataset.
2. Prediction of Cardiovascular Diseases using Machine Learning algorithms.

Course Outcomes:

After the completion of this course, the learners will be able to:

1. Understanding the datatypes of existing in healthcare data.
2. Identify the need for Data preprocessing.
3. Apply the meaningful way of handling data and analysis
4. Analyze the need for AI in Healthcare.
5. Analyze different AI and MI tools for healthcare system.

Text Books:

1. Sittig & Ash, Clinical Information Systems – Overcoming Adverse Consequences, Jones &Bartlett Learning Publishers, 2009.
2. Edward H. Short liffe; Leslie E. Perreault, Medical Informatics – Computer Applications in Healthcare and Biomedicine, Springer-Verlag New York Inc.Publishers, 2014.
3. Wes McKinney, 2018. *Python for Data Analysis*, 2nd Edition O'Reilly Media, Inc.
4. Arnold, M. (2016). Digital health news update: Machine learning meets health search. Decision Resources Group.

Reference Books:

1. Cohen, I. G., Gasser, U., Fernandez Lynch, H. &Vayena, E. (2018). *Big Data, Health Law, and Bioethics*. Cambridge, Cambridge University Press.
2. Hovenga, E. J. S. & Grain, H. (Eds.). (2013). *Health information governance in a digital environment*. *Studies in Health Technology Informatics 193*. IOS Press.
3. International Organization for Standardization (2019). ISO/TS 21526:2019. Health informatics – Metadata repository requirements (MetaRep). International Organization for Standardization
4. Coiera, E. (2015). *Guide to health informatics* (3rd ed.). CRC Press, Taylor & Francis Group.
5. Arora, C. (2019). Digital health fiduciaries: Protecting user privacy when sharing health data.' *Ethics and Information Technology* 21, 181-196.

6. Baric-Parker, J., & Anderson, E. E. (2020) Patient data-sharing for AI: Ethical challenges, Catholic solutions. *The Linacre Quarterly, (87)*4, 471–81. https://doi.org/10.1177/0024363920922690

TAUT2201G **COSMETIC SCIENCE** **L T P C**
3 0 0 3

Course Description:
This subject covers the science of cosmetic and cosmeceutical products, including their classification, formulation, excipients, and applications. It explores the structure and function of skin, hair, and oral cavity, focusing on product efficacy. Students will study regulations, herbal ingredients, and quality control methods. The course also delves into common cosmetic issues and the formulation of skincare, haircare, and oral care products.

Course Objectives:
Upon completion of the subject, the student shall be able to
1. Understand the classification of cosmetics and cosmeceuticals as per Indian and EU regulations.
2. To study the principles of formulation and building blocks of Skin Care and Hair Care Products.
3. Role of Herbs in cosmetics and understanding BIS specifications and analytical methods for cosmetic products.
4. Learn techniques like sebumeter, corneometer, TEWL, and hair tensile strength measurement.
5. To study actives and mechanisms of antiperspirants and deodorants.

UNIT I **10 Hrs**
Classification of cosmetic and cosmeceutical products, Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticalsfrom cosmetics, cosmetics as quasi and OTC drugs. **Cosmetic excipients:** Surfactants, rheology modifiers, humectants, emollients, preservatives. Classification and application.
Skin: Basic structure and function of skin.
Hair: Basic structure of hair. Hair growth cycle.
Oral Cavity: Common problem associated with teeth and gums**.**

UNIT II **10 Hrs**
Principles of formulation and building blocks of skin care products:
Face wash, Moisturizing cream, Cold Cream, Vanishing cream and their advantages and disadvantages. Application of these products in formulation of cosmeceuticals.
Antiperspirants & deodorants- Actives & mechanism of action.
Principles of formulation and building blocks of Hair care products: Conditioning shampoo, Hair conditioner, anti-dandruff shampoo, Hair oils. Chemistry and formulation of Para-phylene diamine-based hair dye. Principles of formulation and building blocks of oral care products: Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash.

UNIT III **10 Hrs**
Sun protection, Classification of Sunscreens and SPF.
Role of herbs in cosmetics:
Skin Care: Aloe and turmeric
Hair care: Henna and amla.

Oral care: Neem and clove

Analytical cosmetics: BIS specification and analytical methods for shampoo, skin-cream and toothpaste**.**

UNIT IV **8 Hrs**

Principles of Cosmetic Evaluation: Principles of sebumeter, corneometer. Measurementof TEWL, Skin Color, Hair tensile strength, Hair combing properties Soaps, and syndet bars. Evolution and skin benefits.

UNIT V **7 Hrs**

Oily and dry skin causes leading to dry skin, skin moisturization. Basic understanding of the terms Comedogenic, dermatitis. Cosmetic problems associated with Hair and scalp: Dandruff, Hair fall causes Cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat and body odor. Antiperspirants and Deodorants - Actives and mechanism of action.

Course Outcomes:

The course is designed to impart knowledge and skills necessary for fundamental need for cosmetics and cosmeceutical products. Upon completion of this course students should be able to

1. Understand the key ingredients in cosmetics and cosmeceuticals
2. Understand the key building blocks for various formulations
3. Understand the current technologies in the market
4. Understand various key ingredients and basic science to develop cosmetics and cosmeceuticals
5. Understand the scientific knowledge to develop cosmetics and cosmeceuticals with desired safety, stability and efficacy

Text Books:

1. Text Book of Cosmetics by Rajesh Kumar Nema, CBS Publishers
2. Text book of cosmeticology by Sanju Nanda & Roop K. Khar, Tata Publishers.
3. Textbook of Cosmetics and Cosmeticuticals, Prachi Pandey, Rahul Pal Dr. Himmat Singh Chawra Dr. Ravindra Pal Singh Manju Koli
4. Herbal plants and their applications in cosmeceuticals by Das K, CBS Publisher

Reference 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. A Textbook on Herbal Cosmetic Technology, Dr. B. Ramya Kuber

TAUT2201H 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

Learning outcomes

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.

Course Outcomes:

1. Familiarization of hospital planning
2. Understand the various services offered in the hospital
3. Plan and organize services provisions between the departments.
4. Coordinate and communicate and bridge the gaps between the departments and able to administer the departments.
5. Understand the importance of safety and security in the hospital

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.