ACADEMIC PROGRAMME GUIDE

BACHELOR OF ENGINEERING
(COMPUTER SCIENCE ENGINEERING)

Batch 2018

CHITKARA UNIVERSITY
HIMACHAL PRADESH - NAAC Accredited

Department of Computer Science Engineering
Chitkara University School of Engineering and Technology
Chitkara University, Himachal Pradesh, India

INDEX

1. General Information

The Academic Program Guide (APG) is a comprehensive document detailing course scheme, associated credits per course and the distribution of each course in lecture, tutorial and practical hours. It also details the eligibility criteria for admission, for award of degree, the assessment and evaluation procedures along- with a glimpse of the pedagogical aspects of the programs. This guide is to be used in association with the academic regulations of the university to make a complete rule set. The course scheme given in this document is approved by Board of Studies and the Academic Council of Chitkara University.

2. Eligibility for Admission

The student seeking admission in B.E. program should have minimum aggregate of 60% marks or must have secured 60% in Physics, Chemistry and Mathematics in 12^{th} grade. He / She should have appeared in JEE Mains for that admission year. The admission is based purely on merit.

3. Duration and Stages

The duration of the BE program is four years - divided into 8 semesters. University conducts end term examination at the end of each semester, except in the case of Industry Oriented Hands on Experience (IOHE) or Internship at Industry, which is evaluated by a jury appointed by the University.

The maximum duration of completion of degree is 6 years.

4. Rules for Attendance

The program being highly rigorous, all the students are expected to show utmost regularity in attendance. Even a day's absence is detrimental to student's interest. Therefore, University's requirements in this regard are very stringent.

The University expects its students to be regular in attending the classes. 75% attendance (of all held sessions – lectures, tutorials, project work) is compulsory in a course in order to be eligible to appear for End Term Examination. The students are also encouraged for participation in co-curricular activities and can do so in 25% cushion provided in the attendance requirements. 10% concession in attendance requirements is possible only in case of extreme circumstances and at the sole discretion of the Vice Chancellor.

5. Registration for Next Semester

5.01 All students are eligible to register for next semester irrespective of number of backlogs.

5.02 A student is not permitted to register in a term if

(a) He/She has dues outstanding to the University, hostel, or any recognized authority or body of the University, or

(b) His/Her grade sheet in his/her immediately preceding term is withheld, or

(c) He/She has been specifically debarred or asked to stay away from that term

5.03 Late registration may be granted in case a student fails to register on the stipulated date. Students failing to register on the specified day of registration will be allowed to register only after permission from Dean of Department and after paying the stipulated late fee. Any student who has not registered will not be allowed to attend classes.

5.04 The registration of the student may be cancelled, if at the later stage, it is found that the student is not eligible for registration due to following reasons:

(a) If the registration of a student in a course is not found to be in accordance with the regulations, his/her registration in that course will be cancelled and the grade obtained, if any, will be rejected.

(b) The registration of a student in a course or complete set of courses in a term can be cancelled by the concerned authority when he is found guilty in case of unfair means, breach of discipline, etc. or when he/she persistently and deliberately does not pay his dues.

(c) Absence for a period of four or more weeks at a stretch during a term shall result in automatic cancellation of the registration of a student from all the courses in that term.

5.05 A student who is duly registered in a term is considered to be on the rolls of the university. After registration, if he/she withdraws from the term, or has been given prior permission to temporarily withdraw from the University for the term, or has been asked to stay away by an appropriate authority of the University will be considered to be on the rolls of the University for that term. While such a student retains the nominal advantage of being on the rolls of the University the loss of time from studies and its consequences cannot be helped by the University.

5.06 If for any valid reason a student is unable to register in a term, he/she must seek prior permission of Dean of Department to drop the term. If such permission has not been requested or after a request the permission has been denied, his/her name would be struck off the rolls of the University and he would no longer be a student of the University. His/her case will be automatically processed and the file will be closed. However, if such a student, after his/her name has been struck off the rolls of the University, is permitted to come back, his/her case can be considered at the sole discretion of the competent authority of the University with the provision that all his/her previous records as a former student are revived under the current academic and administrative structure, regulations and schedule of fees.

6. Letter Award Grading Scheme

The list of Letter Grades is given in Table 1:

% Marks Range of total	Grade	Grade Point	Qualitative Meaning
80-100	O	10	Outstanding
70-79	A+	9	Excellent
60-69	A	8	Very Good
55-59	B+	7	Good
50-54	B	6	Above Average
45-49	C	5	Average
40-44	P	4	Pass
0-39	F	0	Fail
	I	0	Incomplete / Absent

Table 1: Grading scheme

The medium of examination is English. Criteria to pass examination is based on the marks obtained by the student in a particular course as described in tables above, the grade in that course is obtained, in accordance with the Table-1.
If a student obtains grade P or above, he/she is declared pass in that course. The grade F is equivalent to being fail in that course, in which case, the student has to reappear in the end term examination of that course again, whenever its exam is conducted again with the regular examination, after payment of appropriate examination fee. The rules for grading in reappear exam will be applicable as per examination policy of the University.

If the student is detained from appearing in the end term examination because of shortage of attendance in the regular semester or is absent in the end term exam, his/her grade in that course is I, till he/she appears again in the end term examination and obtains a new grade.

7. Promotion Rules

Any bonafide student, who appears for the examination conducted by the University, shall be promoted to the next higher semester and shall carry forward all course(s) in which he/she is declared fail. The student shall have to pass all papers within stipulated maximum duration as prescribed by the University to qualify for the award of degree.

8. Change of Branch

In case of availability of seats, student can apply for branch change. The student shall have to pass all papers of first year and possess minimum CGPA criteria. Preference will be given to high CGPA.

9. Pedagogical Aspects

The structural layout of the program and its courses requires that each course be divided in lecture, tutorial and practical sessions. Duration of each session as given in the column against the course in the course scheme is 50 minutes.

Lecture sessions: Lectures are delivered by traditional - chalk board method, supplemented by modern Information Communication Technology (ICT) methods. The students are encouraged to ask questions and involve in group discussion to the extent allowed by the teacher. In some courses where case study-based methodology is adopted, the lectures are supplemented by discussions on case studies.

Tutorial Sessions: The tutorial sessions are small groups of students interacting with the teacher, solving application oriented analytical problems. The tutorial sessions are very interactive and inculcate problem solving skills in the students.

Lab / Practical Sessions: During lab / practical sessions, the students work on prescribed list of experiments and do what they have learnt in the lecture / tutorial sessions.

10. Program Overview

Computer Science and Engineering is an evolving stream that is directly or indirectly affecting all other disciplines. Computers are becoming ubiquitous, appearing in a variety of forms in homes, industries and academia. This stream involves modeling of all other engineered, natural, and human systems.

The four-year B.E. (CSE) Program is designed to provide conceptual knowledge of core courses in the field of Computer Science and Engineering. Various courses offered are in the areas of programming languages, database management, computational complexity theory, software engineering, algorithms, system architecture, operating system and many more. The program will emphasize on teaching fundamentals of basic courses along with the practical applications. Apart from core courses students will be offered discipline electives and specialization elective courses in a view to provide in-depth knowledge and encourage research in integrated areas. In project courses, students are required to give practical shape to the concepts they have learned in various courses. Besides above, the students must complete one semester training / internship in final academic year, towards fulfillment of degree requirements.

10.1. Program Outcomes

The department expects the undergraduate students to be able to demonstrate the following outcomes. The students are expected to be able to:

PO1. Apply the knowledge of mathematics, science and engineering for the solution of problems appropriate to discipline.

PO2. Analyze a problem, identify and define the computing requirements appropriate for its solution.

PO3. Design, implement and evaluate software and/or hardware to meet desired needs.
PO4. Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary areas.
PO5. Recognize professional responsibilities in computing practice based on legal, social, ethical and environmental principles.
PO6. Communicate effectively in a variety of professional contexts.
PO7. Apply professional knowledge to create innovative career path or pursue higher or more specialized education as per interests and requirements.
PO8. Recognize the need for life-long learning to demonstrate their ability to adapt to a rapidly changing environment by applying new skills and new technologies.
PO9. Transition from engineering conceptual knowledge to real engineering applications.

Program Specific Outcomes

PSO1. Apply the fundamentals of mathematics, science and engineering knowledge to understand, analyze and develop computer programs of varying complexity in different domains of business related to software development, mobile computing, algorithms, multimedia, big data analytics, machine learning, artificial intelligence, networking, security and other areas of modern computing.
PSO2. Develop an understanding of the work already done; extend, design, develop, communicate and integrate engineering techniques with engineering hardware and software for a sustained spirit of experimentation and research for lifelong learning, research and innovation in multi-disciplinary environments for contributions to the science community.
PSO3. Implement professional engineering solutions and improvised solutions aimed at solving societal issues and evolving human needs, keeping the ethics and environmental context in perspective for elevated significant contributions to the society.

10.2. Course Structure

The various courses prescribed for a Program is categorized in terms of their functional objectives as follows:

10.2.1 Core Courses: Core courses are the foundation courses that cater to develop the breadth of Computer Science stream and also include Humanities, Social Science, Management, Mathematics, Basic Science and Engineering Science courses. Core courses are compulsory and can be offered in any semester during the program tenure provided it meets the pre-requisite requirement. It is divided into these four categories:

a) Humanities, Social Science and Management (HSM)
b) Basic Science (BSC)
c) Engineering Science (ESC)

d) Professional Core (PC)

10.2.2 **Electives:** The technical courses apart from core courses are offered as electives to the students. These are the professional courses that are offered to students to cover the depth in specific area of computer science for their employment, research or for higher education. It also includes courses from other departments and/or streams. The students may also choose a specialization track to enhance their skills in particular area and to gain industry exposure. It includes:

a) Professional Electives (PE)
b) Open Electives (OE)

10.2.3 **Special Courses (SC):**

a) Projects and Industry Oriented Hands-on Experience (IOHE): These are hands-on courses to apply the knowledge gained through core/elective courses. The students identify their team-mates and work on a unique project. The projects can be suggested by faculty or by students after getting due approval from faculty-in-charge. The projects are allotted to them at the start of semester. The project statements are made in such a way that the students while working on these projects apply the concepts learned so far and the deliverables are multi-faceted.

b) Engineering Exploration Courses: Students are given a choice of technical and industry-oriented courses to get the knowledge of new technologies/skills. Students also have an option of choosing the courses from online platforms like MOOC (NPTEL/SWAYAM) or Nanodegree courses.

10.3. Program Structure

Course type	HSM	BSC	ESC	PC	PE	SC	Total
Credits (Co-op)	16	20	27	46	16 to 21	48	**173 to 178**
Credits (Non-Co-op)	16	20	27	46	29 to 34	32	**170 to 175**

- The number of courses may vary in a semester based on the choice of electives / specialization courses.
- Student may earn credits of seventh and eighth semester by taking co-op training.
- Student can choose additional electives instead of specialization courses in fifth and sixth semester.
- Student can choose additional electives instead of co-op training in the seventh semester.
- Credits may vary subject to the choice of courses and conditions.

- Minimum credits to be earned by a student is 170

10.4. List of Courses:

Course Code	Course Name	L-T-P	Credits
Humanities, Social Science and Management Courses (HSM)			**16**
GEL4101	Environmental Sciences	4-0-0	4
HUL2401	Cyber Security	2-0-0	2
HUL3301	Human Rights and Values	3-0-0	3
HUL2101	Disaster Management	1-0-0	1
CLP2305	Industry Interface	0-0-4	2
GTI4301	Numerical Ability and Logical Reasoning	4-0-0	4

Basic Science Courses (BSC)			**20**
AML5101	Engineering Mathematics – I	4-1-0	5
AML4209	Discrete Structures	4-1-0	5
PYL5101	Engineering Physics	3-1-0	4
PYP1101	Engineering Physics Lab	0-0-2	1
CHL4101	Engineering Chemistry	3-1-0	4
CHP1101	Engineering Chemistry Lab	0-0-2	1

Engineering Science Courses (ESC)			**27**
MEW2101	Manufacturing Practice	0-0-4	2
MEL4102	Engineering Graphics	2-0-0	2
MEP1102	Engineering Graphics Lab	0-0-6	3
EEL4103	Basics of Electrical Engineering	3-1-0	4
EEP1103	Basics of Electrical Engineering Lab	0-0-2	1
ECL5101	Basics of Electronics Engineering	3-1-0	4
ECP1101	Basics of Electronics Engineering Lab	0-0-2	1
ECL4207	Digital Electronics and Logic Design	3-1-0	4
ECP1207	Digital Electronics and Logic Design Lab	0-0-2	1
S101	Introduction to C Programming	3-1-2	5

Professional Core Courses (PC)			**46**
CS102	Object Oriented Programming using C++	2-0-8	6
CSP3213	Introduction to Linux	0-0-6	3
CSL4207	Operating Systems	3-1-0	4
CSL4208	Computer System Architecture	3-1-0	4
CSL3203	Computer Networks	3-0-0	3

CSP2203	Computer Networks Lab	0-0-4	2
CSL4209	Client-Side Technologies	4-0-0	4
CSP3209	Client-Side Technologies Lab	0-0-6	3
CSL3307	Software Engineering	3-0-0	3
CSP1307	Software Engineering Lab	0-0-2	1
CSL4206	Database Management System	3-1-0	4
CSP2206	Database Management System Lab	0-0-4	2
CSL2301	Advanced Database Management System	2-0-0	2
CSP2301	Advanced Database Management System Lab	0-0-4	2

Professional Electives			
A. Open Track			
CS109	Core Java	0-0-10	5
CSL4349	Advanced Java	0-0-8	4
CS114	Data Structures	4-1-0	5
CSL5302	Web Programming	0-0-10	5
CSL2347	Introduction to DevOps	2-0-0	2
CSL5356	Front-end Development	0-0-10	5
CSL5359	Back-end Development	0-0-10	5
CSL5357	User Interface Design	2-0-4	5
CSL4377	Cloud Computing	0-0-8	4
CSL4378	Dynamic Programming	4-0-0	4
CSL4380	AWS (App Development)	0-0-8	4
CSL4381	PEGA (Computer Solution Architect)	0-0-8	4
EP3001	Entrepreneurship	2-0-0	2
B. Specialization Tracks			
a) Programming			
CSL4336	Algorithm Design & Implementation	4-0-0	4
CSL4306	Designing front End using Web development	0-0-8	4
CSP2325	Operating System Essentials	0-0-4	2
b) Data Science			
CSL4341	Python Basics	4-0-0	4
CSA3103	Data Visualization and Query Language	0-0-4	2
CSL4348	Business Analytics	2-0-4	4
CSL5358	Industry Competitiveness Preparation	2-0-4	4

c) Cyber Security			
CSQ3101	Cyber Security for under graduates – I	3-0-0	3
CSQ3102	Cyber Security for Forensics & Investigation	3-0-2	4

CSQ3103	Malware and Reverse Engineering – I	3-0-0	3
CSQ3104	Malware and Reverse Engineering – II	3-0-0	3
CSQ3105	Introduction to Cyber Security	4-0-0	4
CSQ3106	Digital Security and Advanced Cryptography	4-0-0	4
CSQ3107	Secure Software Development	4-0-0	4
d) Game Development			
GID5356	Fundamentals of Game Programming	1-0-8	5
GID5357	Introduction to Game Engine	1-0-8	5
GID5358	Graphics Programming	1-0-4	3
GID5352	Game Design	1-2-0	2
GID5359	Game Design 2D & 3D	2-2-0	3
GID5360	Game Design BG	1-0-4	3
GID5361	Game Testing	1-0-2	2
GID5362	AI/ML	1-0-6	4
GID5363	Unity Game Development	1-0-8	5
GID5364	AR/VR	1-0-6	4

e) Digital Marketing			
CSL3361	Digital & Social Media Marketing Building Blocks and Content Development & Marketing	3-0-0	3
CSL3362	Search Engine Marketing (SEO & PPC), Web Analysis and Email Marketing & Management	3-0-0	3
CSL3363	Social Media Marketing & Optimization and Digital Marketing Strategy & Lead Generation	3-0-0	3
CSL3364	Affiliate Marketing and Online Reputation Management (ORM)	3-0-0	3
f) CEED Accelerator Program			
CSL4365	Entrepreneurship and Opportunity	3-0-2	4
CSL4366	Consumer and Market Research for Entrepreneurs	3-0-2	4
CSL4367	New Venture Creation	2-0-2	4
CSL4368	The Entrepreneurial Innovator and Internship	2-0-2	4
CSL3369	A Month Internship with Live Start-ups and Demo Day Credits	2-0-2	3
CSL3370	Venture Building Strategies	2-1-0	3
CSL3371	Family Entrepreneurship Amplifier	2-1-0	3
CSL4372	Raising Money: VCs, Angels and Incubators	3-1-0	4

CSL4373	Future Trends in Entrepreneurial Ventures	2-2-0	4
CSL3374	Training	2-1-0	3
CSL3375	Final Pitch	2-1-0	3
C. Departmental Elective Courses			
CSL3308	Software Quality Assurance & Testing	3-0-0	3
CSP1308	Software Quality Assurance & Testing Lab	0-0-2	1
CSL3310	Business Intelligence and Data Warehousing	3-0-0	3
CSP1310	Business Intelligence and Data Warehousing Lab	0-0-2	1
CSL3304	Artificial Intelligence and Expert System	3-0-0	3
CSP1304	Artificial Intelligence and Expert System Lab	0-0-2	1
CSL4305	Theory of Computation	3-1-0	4
CSL5407	Compiler Design	4-1-0	5
CSL5411	Network Security	4-1-0	5

Special Courses			
a) Project			
CSP3203	Integrated Project	0-0-4	3
CSP4401	Lab Oriented Project	0-0-7	4
CST9411	Co-op project at Industry (Module-1)	-	20
CST9412	Co-op project at Industry (Module-2)	-	20
CST9401	Industry Oriented Hands-on Experience	-	20
b) Engineering Exploration			
ASE3101	Engineering Exploration	2-0-2	3
CS201	Engineering Exploration-I	0-0-4	2

List of courses offered in Engineering Exploration

Offline Courses	Internet of Things
	Introduction to Internet of Things
	Machine Learning
	Engineering Projects in Community Services
	Intellectual Property Rights
	Analytical Approach to Logic Building

	Red Hat Linux System Administration
	Data Visualization
	Ethical Hacking
	Digital Marketing
	Publishing Research
	Entrepreneurship
	Robotics Process Automation
	Speech Recognition
	Image Processing
Foreign Language Certification Courses	German
	Japanese
	Spanish
	Chinese Mandarin
Nanodegree Courses	Android Basics
	Android Developer Term 1
	Android Developer Term 2
	Front End
	Full Stack
	Machine Learning Term 1
	Machine Learning Term 2
	Introduction to Programming
	Artificial Intelligence with Python
	Deep Learning
	Data Analyst
	Business Analytics
	React
	Data Scientist Term 1
	Data Scientist Term 2
	Machine Learning Foundation
	Big Data Foundation
MOOC	The joy of Computing using Python
	Ethical Hacking
	Introduction to Internet of Things
	Programming in Java
	Artificial Intelligence Search Methods for Problem Solving
	An Introduction to programming through C++
	Software Testing
	Introduction to Machine Learning
	Blockchain Architecture Design and Use Cases

	Discrete Mathematics
	Python for Data Science
	Programming, Data Structures and Algorithms Using Python
	Computer Vision
	Programming in C++
	E-Commerce Technologies

Model Course Structure

Semester-1				Semester-2			
S.No	**Title of the Course**	**L-T-P**	**Credits**	**S.No**	**Title of the Course**	**L-T-P**	**Credits**
1	Engineering Mathematics- I	4-1-0	5	1	Discrete Structures	5-0-0	5
2	Basics of Electrical Engineering	3-1-2	5	2	Basics of Electronics Engineering	3-1-2	5
3	Engineering Chemistry	3-1-2	5	3	Engineering Physics	3-1-2	5
4	Engineering Graphics	2-0-6	5	4	Introduction to C Programming	0-0-10	5
5	Disaster Management	1-0-0	1	5	Engineering Exploration	2-0-2	3
6	Environmental Science	1-0-6	4	6	Manufacturing Practices		2
			25				**25**

Semester-3				Semester-4			
S.No	**Title of the Course**	**L-T-P**	**Credits**	**S.No**	**Title of the Course**	**L-T-P**	**Credits**
1	Object Oriented Programming using C++	2-0-8	6	1	Client-Side Technologies	4-0-6	7
2	Computer Networks	3-0-4	5	2	Database Management System	3-1-4	6
3	Digital Electronics and Logic Design	3-1-2	5	3	Software Engineering	3-0-2	4
4	Introduction to Linux	0-0-6	3	4	Core Java	0-0-10	5
5	Operating System	3-1-0	4	5	Engineering Exploration	2-0-0	3
			23				**25**

Semester-5				Semester-6			
S.No	**Title of the Course**	**L-T-P**	**Credits**	**S.No**	**Title of the Course**	**L-T-P**	**Credits**
1	Computer System Architecture	3-1-0	4	1	Numerical Ability and Logical Reasoning	0-0-8	4
2	Advanced Database Management System	2-0-4	4	2	Web Development	0-0-8	4
3	Operating System Essentials	0-0-4	2	3	Integrated Project	0-0-4	3
4	Algorithm Design & Implementation	4-0-0	4	4	AWS (App Development)	0-0-8	4
5	Advanced Programming Concepts	0-0-8	4	5	Industry Readiness	0-0-8	2
6	Cyber Security	2-0-0	2				
7	Human Right and Values	3-0-0	3				
			23				**17**

Semester-7				Semester-8			
S.No	**Title of the Course**	**L-T-P**	**Credits**	**S.No**	**Title of the Course**	**L-T-P**	**Credits**
1	Elective - IV	4-0-0	4	1	Industry Oriented Hands-on Experience	- - -	20
2	Elective - V	4-0-0	4				
3	Elective - VI	4-1-0	5				
4	Lab Oriented Project	0-0-8	4				
			17 *				**20 ***

*** Students opting co-op training in seventh and eighth semesters will earn 40 credits**

11. Assessment and Evaluation

The evaluation will be continuous and the weight-age of various components is as given in Tables specified for each type of course. The evaluation of all courses will be detailed in the course handout document prepared by course coordinator with the approval of Dean. The document will be shared with students before the start of session.

Evaluation for Core / Elective / Specialization Course:

Courses can be evaluated in one of these three ways depending upon the course					
Quizzes/Assignments/Class Tests/Case Studies	10	Formative Assessments (FAs)	20	Sessional Tests (STs)	40
Sessional Tests (STs)	30	Sessional Tests (STs)	30		
End Term Examination	60	End Term Examination	50	End Term Examination	60
Total	**100**	**Total**	**100**	**Total**	**100**

Table 2: Evaluation components for Theory Courses

There are three Sessional Tests (STs) for all theory papers, the average of best two are considered. However, course coordinator, with the approval of Dean may decide the number of STs required for specific course. The policy on the evaluation component – 'Quizzes / Tutorials / Assignments' (if applicable else weightage is merged in STs) as decided by the course coordinator and Dean and is announced separately for each course.

The evaluation components for Lab Courses have weightage for regular lab performances, internal viva-voce, conducted at the end of academic semester. The End Term Examination for lab courses includes conduct of experiment and an oral examination (viva voce).

Lab Courses	
Lab Performances / File work	40
Internal Viva – Voce	20
End Term	40
Total	**100**

Table 3: Evaluation Components for Lab Courses

Evaluation for Integrated / Lab Oriented Project Courses:

Project Courses	
Planning	10
Performance	20
Internal Viva-Voce/Presentation/ Project Report	30
End Term/ Project Display/ External viva-voce	40
Total	**100**

Table 4: Evaluation Components for Project Courses

Evaluation for Co-op Projects / Industry Oriented Hands-on Experience Courses:

Industry Oriented Specific Courses	
Employer / Industry Expert Assessment	20
Synopsis	10
Mid Term Evaluation	30
Final Evaluation	40
Total	**100**

Table 5: Evaluation Components for Skill Oriented industry Specific Courses

Evaluation for Engineering Exploration Courses: There are two mid-term evaluation and one evaluation at the end of the course. The type of evaluation may vary depending on the course type on the discretion of course Expert. It is decided before the commencement of course and provided prior information to the students.

Evaluation for Mandatory Courses: There is only End term Examination for these courses with 100% weightage.

12. Eligibility for Award of Degree

In order to be eligible for award of B.E. degree in Computer Science and Engineering, student must successfully complete all the courses in which he/she has registered with minimum 165 credits, and minimum CGPA of 4.5.

Appendix-A: Course Description

GEL4101 Environmental Sciences

CLOs

1. Describes all eight characteristics of living things.
2. Describes all four groups of biological molecules.
3. Describe the seven major structures and functions of the plasma membrane.
4. Identify a function of each of the different structures found in cells and state whether each would be found in prokaryotic, plant, or animal cells
5. Describe five major reactions of photosynthesis
6. Describe the evidence for DNA being the genetic material, how the molecular structure of DNA was worked out, and how DNA is copied, packaged and organized into chromosomes.

Multidisciplinary nature of environmental studies: Definition, Scope and Importance; Need for Public Awareness.

Natural Resources: Renewable and non-renewable resources Associated problems- Forest resources, use and over, exploitation, deforestation, timber extraction, mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and ground water, floods, drought, conflicts over water, dams, benefits and problem. Mineral resources- Use and exploitation, environmental effects of extracting and using mineral resources. Food resources- World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources-Growing energy needs, renewable and non- renewable energy sources, Uses of various alternate energy sources. Land resources- Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources equitable use of resources for sustainable lifestyles.

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem. Producers, consumers and decomposers. Food chains, food webs and Ecological pyramids. Energy flow in the ecosystem, Biogeochemical cycles. Ecological succession. Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem, b. Grassland ecosystem, c. Desert ecosystem, d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries.

Biodiversity and its conservation: Introduction - Definition: genetic, species and ecosystem diversity. Value of biodiversity- consumptive use, productive use, social, ethical, aesthetic and option values. Bio-geographical classification of India. Biodiversity at global, National and local levels, India as a mega diversity nation, Hot-spots of biodiversity.

Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts, Endangered and endemic species of India. Conservation of biodiversity- in-situ and

ex-situ conservation of biodiversity.

Environmental Pollution: Definition, Cause, effects and control measures of: a. Air pollution, b. Water pollution. Noise pollution, d. Soil pollution e. Marine pollution, f. Thermal pollution. Nuclear hazards. Solid waste Management- Causes, effects and control measures of urban wastes and industrial wastes. E-waste introduction. Role of an individual in prevention of pollution.

Disaster management: floods, earthquake, cyclone and landslides. Social Issues and the Environment: From Unsustainable to Sustainable development -Urban problems related to energy, Environmental ethics, Issues and possible solutions. Water conservation, rain water harvesting, and watershed management. Resettlement and rehabilitation of people; its problems and concerns. Climate change, global warming, acid rain. Ozone layer depletion, nuclear accidents and holocaust; Case Studies, Wasteland reclamation – Consumerism and waste products. Environment Protection Act. Water (Prevention and control of Pollution) Act. Air (Prevention and Control of Pollution) Act, Wildlife Protection Act**,** Forest Conservation Act. Issues involved in enforcement of environmental legislation, Public awareness. Human Population and the Environment: Population growth, variation among nations, Population explosion - Family Welfare Program. Environment and human health, HIV/AIDS, Human Rights, Value Education. Women and Child Welfare, Role of information Technology in Environment and human health.

HUL2401 Cyber Security

CLO -1 Graduates will be able to perform in technical/managerial roles ranging from design, development, problem solving to production support in software industries and R&D sectors.

CLO -2 Graduates will be able to successfully pursue higher education in reputed institutions .

CLO -3 Graduates will have the ability to adapt, contribute and innovate new technologies and systems in the key domains of Computer Science and Engineering.

CLO -4 Graduates will be ethically and socially responsible solution providers and entrepreneurs in Computer Science and other engineering disciplines.

CLO -5Graduates will possess the additional skills in securing the network and IT infrastructure in Cyberspace

CLO-6Graduates will have the key ability to strengthen the cyber ecosystem

Introduction to Security: Security principles, threats and attack techniques.

Basics of Cryptography: Cryptographic mechanisms, Classical Encryption Techniques Symmetric and Asymmetric cryptography (basics). Introduction to cybercrime, cybercrime and information security, Classifications of cybercrimes, Cybercrime and the Indian ITA 2000.

Cyber offenses: Introduction, how criminals plan the attacks? Botnets-The fuel for cyber-crime, Phishing, Password cracking, key loggers and sql injection, attacks on wireless networks. Cost of cyber-crimes and IPR issues: lessons for organization, web threats for organization, security and privacy implications from cloud computing, social media marketing- security risks and perils for organizations, social computing and the associated challenges for organizations, protecting people's privacy in the organization, organizational guidelines for internet usage, safe computing guidelines and computer usage policy, incident handling-an essential component of cyber security.

Forensics: Best practices for organizations, Media and Asset Protection, Importance of endpoint security in organizations, cybercrime and cyber terrorism: social, political, ethical and psychological dimensions, introduction, intellectual property in the cyberspace, the ethical dimensions of cybercrimes, the Psychology, mindset and skills of hackers and other cybercriminals. Cybercrime: Illustrations, Examples and mini cases, Illustrations of financial frauds in cyber domain, digital signature related crime scenarios

HUL3301 Human Right and Values

Course Outcomes

1. Identify the core values that shape the ethical behavior of an engineer
2. To create an awareness on professional ethics and Human Values
3. To appreciate the rights of others

Concept of human values and value education: Aim of education and value education; Concept of Human values; types of values; Components of value education, Personal development: Self-analysis, gender equality, physically challenged, intellectually challenged.

Respect to - age, experience, maturity, family members, neighbors, co-workers, Character formation towards positive personality, Truthfulness, sacrifice, sincerity, self-control, Tolerance, Value education towards national and global development: national values - Democracy, socialism, secularism, equality, justice, liberty, freedom and fraternity.

Social Values: Pity, self- control, universal brotherhood, Professional Values - Knowledge thirst, sincerity in profession, ethics, regularity, punctuality and faith, Religious Values - Tolerance, wisdom, character.

National Integration and international understanding: Impact of global development on ethics and values Modern Challenges of Adolescent Emotions and behavior; Comparison and competition; positive and negative thoughts, Adolescent Emotions, arrogance, anger, selfishness, defiance, Therapeutic measures Control of the mind through physical exercise, meditation (Objectives, types, effect on body, mind and soul) and Yog- sadhna, Human rights – general: Concept of Human Rights

– Indian and International Perspectives.

Evolution of Human Rights: Definitions under Indian and International documents, Human rights: Right to Life and Liberty, Right to Equality, Right against Exploitation, Cultural and Educational Rights, Economic Rights, Political Rights, Social Rights, Human rights of women and children: Social Practice and Constitutional Safeguards, Female Foeticide and Infanticide, Physical assault and harassment, Domestic violence Conditions of Working Women, Institutions for implementation: Violation by State, Violation by Individuals, Nuclear Weapons and terrorism Safeguards.

HUL2101 Disaster Management

Disasters: Classification, Causes, Impacts: Introduction to Disasters: Concepts, and definitions (Disaster, Hazard, Vulnerability, Resilience, Risks). Impacts (including social, economic, political, environmental, health, psychosocial, etc. Differential impacts- in terms of caste, class, gender, age, location, disability). Classification of hazards/disasters and causes. Principles of disaster management: **Approaches to Disaster Risk reduction:** Disaster cycle - its analysis, Phases, Culture of safety, prevention, mitigation and preparedness, Community based DRR.

Components of Disaster Relief: Water, Food, Sanitation, Shelter, and Health, Structural and non- structural measures. Hazard Profile (India), Disaster Risk Management in India: Hazard and Vulnerability profile of India. Institutional arrangements (Mitigation, Response and Preparedness, DM Act and Policy, Other related policies, plans, programmes and legislation), Role of Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), states, Centre, and other stake-holders. Disaster and Development: Inter-relationship between Disasters and Development: Factors affecting Vulnerabilities, impact of Development projects such as dams, embankments, changes in Land-use etc. urban disasters, Waste Management.

Global trends in disasters & Adaptation: Global Trends, Complex emergencies, Pandemics Climate change and Adaptation, Relevance of indigenous knowledge, appropriate technology and local resources.

CLP2305 Industry Interface

Course Outcomes

1. To enable students to learn the basic concepts of Project & Production Management.
2. To enable students to implement Project Planning in their Industrial In-plant Training Project work.
3. To be capable of self-education and clearly understand the value of achieving Perfection in the respective Project work.

4. To study the concept of Facility, Location & Layout & implement in their Industrial In-plant training Project work.
5. An understanding of the impact of engineering solutions and industrial safety in a global and social context.

Stages of learning: SWOT analysis, Individual Presentation of SWOT analysis as Ice-breaker. Sample Resume, Resume Making Guidelines. Goal setting, Resume making, Grooming, Body Language Placement Module/Gateway to Industry Grammar*: Work Ethics, Values& Morals PPT, Interpersonal Skills & Empathy PPT Leadership skills: Valuing resources at Work (5 Ms), Grammar** Team work Interview Skills – Acing the Interview, Mock Interviews, Cracking Group Discussions, GD Practice, Panel Interviews, Anger management Stress Interviews – Post course evaluation

GTI4301 Numerical Ability and Logical Reasoning

Course Learning Outcomes

Students will be able to:

1. demonstrate proficiency with number sense (e.g., order of magnitude, estimation, comparisons, effect of operations) and with functional relationships between two or more sets of variable values (i.e., when one or more variables depend upon, or are functions of, other variables) and also relate different representations of such relations (e.g., algebraically or symbolically, as tables of values, as graphs, and verbally)
2. Apply fundamental elements of mathematical, logical, or statistical knowledge to model and solve problems drawn from real life.
3. Develop such quantitative reasoning skills as to be generally useful to students in their further studies, work, and engagement in civic life

Number System: Simplification, Surds & Indices, Square & Square Roots, Formulae Based Problems, HCF & LCM, Percentages, Averages, Ratio & Proportion, Mixtures &Allegation.

Profit & Loss: Simple & Compound Interest, Partnership, Set Theory, Venn Diagrams, Time & Distance, Problem on Trains, Boats & Streams, Races & Games of Skill, Time & Work, Chain Rule, Pipes & Cisterns, Area & Perimeter, Surface Area & Volume, Permutations & Combinations, Probability, Sequence & Series, Linear Equations, Quadratic Equations, Logarithm, Trigonometry, Number Series, Letter Series, Inserting Missing Character.

Number Sequence: Alpha-Numeric Sequence, Time Sequence, Ranking Sequence, Clocks, Calendar, Problem on Ages, Cube Cutting, Cubes & Dices, Arithmetical Reasoning, Quantitative Analysis, Coding-Decoding 1, Coding- Decoding 2.

Classification Puzzles: Comparison, Linear Seating Arrangement, Circular Seating Arrangement, Family Relations, Blood Relations, Condition & Grouping, Direction Sense, Logical Venn Diagrams, Syllogisms, Alphabet Test, Analogy, Odd One Out, Mathematical Operations & Symbol Notations, Mirror Image 1, Mirror Image 2,

Water Image 1, Water Image 2, Data Tabulation, Pie Charts, Bar Graphs, Line Graph, Data Sufficiency, English Grammar- Error Detection, Reading Comprehension.

AML5101 Engineering Mathematics - I

Course Learning Outcomes

i)Student will demonstrate basic knowledge of L.D.E.,P.D.E.,Vector & F.T.

ii)Student will show the understanding of impact of Engg.Mathematics on Mech.

iii)Student will Demonstrate their understanding of mathematical ideas from multiple perspectives, such as by

(a) using the internal connections between geometry, algebra, and numerical computation,

(b) applying the connections between theory and applications, or

(c) distinguishing between a formal proof and a less formal arguments and understanding the different roles these play in mathematics

Differentiation: Geometrical interpretation of derivative, Indefinite and definite (integration by substitution, by parts, by partial fraction), Reduction formulae sine and cosine (with limit $0 - \pi/2$).

Matrices: Review of matrices and determinants, Elementary operations, rank, Inverse of matrix (using rank), Normal form (using rank), Cayley Hamilton theorem (without proof), Solution of a system of linear equations by using rank, Characteristics equations, Eigen values and vectors.

Partial Differentiation & its Applications: Introduction to Partial Derivatives: Function of several variables, Limit and continuity Partial Differentiation, Euler's Theorem, Total derivatives, Partial Derivative of Composite Functions, Implicit Functions, Jacobians, Taylor's Series Expansion, Maclaurin's Series (one and two variables). Applications: Maxima and Minima of functions of two and three variables, Lagrange's method of Undetermined Multipliers.

Multiple Integration and its Applications: Introduction to Double Integration using Cartesian & polar coordinate, Change of order in double integration, Introduction to Triple Integration, Change of variables in Polar, Cylindrical and Spherical Coordinates, Applications of multiple integral to find Area enclosed by Plane curves, Applications of multiple integral to find Volume, Improper integrals of first and second kind, Special Functions: Beta and Gamma functions.

Introduction to Scalars and Vector: Vector Function (Derivative and integral), tangent to the curve, Unit tangent, Scalar and Vector Field, Gradient and its Physical Interpretations, Directional Derivatives. Divergence and its Physical Interpretations, Curl and its Physical Interpretations, Properties of Gradient, Divergence and Curl, Line Integrals, Surface & Volume Integral, Green's Theorem in the Plane (without proof) and applications, Stokes's Theorem (without proof) and

applications, Gauss Divergence Theorem (without proof) and applications.

AML4209 Discrete Structures

Course Learning Outcomes

Students will be able to:

1.Write an argument using logical notation and determine if the argument is or is not valid.

2.Demonstrate the ability to write and evaluate a proof or outline the basic structure of and give examples of each proof technique described.

3.Understand the basic principles of sets and operations in sets.

4.Prove basic set equalities.

5.Apply counting principles to determine probabilities.

6.Demonstrate an understanding of relations and functions and be able to determine their properties

Introducing sets: Properties & operations on sets, subsets, power set, Principle of duality, Cartesian Product of Sets, Partition of sets, Minsets, Maxsets.

Introduction to relations: Types of relation, Pictorial & Matrix representation of relation, inverse relation, composition of relation, properties of relation, Equivalence relation, partial order relation.

Introduction to functions: Types of functions, Domain & range of functions, inverse function, injective, subjective, objective & composition of functions, recursive function, Permutations & Combinations Inclusion exclusion principle, pigeonhole principle.

Recurrence relation: Homogeneous and Non-homogeneous recurrence relations with constant coefficients. Characteristic polynomial & Introduction to generating functions- Methods of generating functions.

Logic: propositions & logical operators, truth table. Laws of logic & Quantifiers, Validity of arguments, truth values.

Lattices: Definitions of lattice, sub lattice, isomorphic lattices, bounded lattices, distributive lattices, complemented lattices, modular lattice.

Boolean algebra: Atoms of Boolean algebra, Boolean expressions, Applications of Boolean algebra to switching theory & Logic Gates.

Graph Theory: Introduction to graphs & Sub graphs. Directed & undirected graph, order& size of graph, Degree of vertex, Source, sink, eccentricity, trial, walk, path, distance, diameter, cycle, wheel. Multi graph, planer graph, Pseudo graph, weighted graph, Regular, complete and Traversable graph. Isomorphism of graphs, sub graphs, complement of graph Adjacency Matrix , Adjacency List, incidence Matrix, Regular, complete and Traversable graph. Complete Bipartite graph & Spanning Graph, Cut vertex, Cut edge, region, Eulerian & Hamiltonian graphs. Euler's formula & its applications-Traveling salesman problem, Konigsberg Bridge

problem, chromatic number & Graph coloring by Welch polch algorithm.

Trees: Binary trees, traversing binary trees, rooted & spanning tree, Algebraic expression trees, Depth-First Search Algorithm, Breadth-First Search Algorithm. Shortest path algorithm: Kruskal's algorithm, increasing order Algorithm, Dijikstra's algorithm, Warshall's Algorithm, Prim's Algorithm.

PYL5101 Engineering Physics

Course Learning Outcomes

The knowledge of Physics relevant to engineering is critical for converting ideas into technology.

1. An understanding of Physics also helps engineers understand the working and limitations of existing devices and techniques, which eventually leads to new innovations and improvements.
2. In the present course, the students can gain knowledge on the mechanism of physical bodies upon the action of forces on them, the generation, transmission and the detection of the waves, Optical Phenomena like Interference, diffraction, the principles of lasers and Fibre Optics.
3. Various chapters establish a strong foundation on the different kinds of characters of several materials and pave a way for them to use in at various technical and engineering applications.

Laser: Introduction, characteristics laser action, stimulated absorption, spontaneous emission, stimulated emission, Population inversion and pumping, Einstein's coefficient, various level lasers, two level, three level, four level, Ruby laser, Helium-Neon laser, Carbon dioxide laser, Semiconductor laser, concepts of Holography.

Fiber Optics: Basic principle of optical fibre, step index and graded index fibers, parameters of optical fibers, acceptance angle, acceptance cone, numerical aperture, Normalized Frequency, No. of modes, Attenuation in optical fibers, intermodal and intramodal dispersion (no derivation), optical fibers in communication and sensors.

Electrodynamics: Vector and scalar fields, Gradient, divergence, curl and their physical interpretation, Gauss's theorem and Stoke's theorem (Statement only), Equation of continuity, Maxwell's equations in free space, Propagation of electromagnetic waves in free space. Special theory of relativity: Frames of reference, postulates of special theory of relativity, Galilean transformation equations. Lorentz's transformation equations, inverse Lorentz's transformation equations (no derivation), length contraction, time dilation Relativistic velocity addition formula, Variation of mass with velocities (concept only) Mass energy relation.

Quantum Mechanics: Postulates of Quantum Mechanics, Group velocity and phase velocity (No relation), De-broglie waves, Uncertainty principle (statement only),

Wave function and its significance, Normalised wave function, Schrodinger wave equations (Time dependent and Time Independent), Particle in a one-dimensional box. Electronic.

Properties of Solids: Free electron theory (quantum theory) density of states, Fermi energy, Fermi Dirac function, Band theory of solids (introduction): metals, semiconductors, insulator, doping Intrinsic and extrinsic semiconductors, carrier concentration of semiconductors, Hall effect (Quantitative idea). Magnetic Materials: Magnetic materials, terminology and classification, Magnetic moments of an atom; orbital, spin and total, Lande's g-factor, Ferromagnetism and related phenomena, the domain structure, the hysteresis loop, types of magnetic materials, soft magnetic materials, hard magnetic materials.

Superconductivity: Superconductivity, introduction, Meissner effect, critical field, Critical current and Isotope effect, Types of superconductors: type I superconductors, type II superconductors, London equations, penetration depth, Cooper pair and BCS theory, high temperature superconductors.

PYP1101 Engineering Physics Lab

Course Outcomes

On Completion of this course, students are able to –

Develop skills to impart practical knowledge in real time solution.

1. Understand principle, concept, working and application of new technology and comparison of results with theoretical calculations.
2. Design new instruments with practical knowledge.
3. Gain knowledge of new concept in the solution of practical oriented problems and to understand more deep knowledge about the solution to theoretical problems.
4. Understand measurement technology, usage of new instruments and real time applications in engineering studies

Practical Implementation of Theoretical Concepts.

CHL4101 Engineering Chemistry

Course Outcomes

CO1. Analyze the need, design and perform a set of experiments.

CO2. Identify the structure of unknown/new compounds with the help of spectroscopy.

CO3. Differentiate hard and soft water, solve the related numerical problems on water purification and its significance in industry and daily life.

CO4. Apply the principles of green chemistry in designing alternative reaction methodologies to minimize hazards and environmental degradation.

CO5. Understand the causes of corrosion, its consequences and methods to minimize

corrosion to improve industrial designs.

Water Technology: Introduction, Sources of water, Impurities in water, Hard and soft water, Units of hardness (Numericals included), Specification for boiler feed water

Boiler problems: Scale and sludge formation, Caustic embrittlement, Priming and Foaming, Boiler corrosion due to oxygen and carbon dioxide, External treatment: Lime –soda process (Numericals included), Zeolite process, Ion exchange process, Internal treatment (different types of conditioning), Specification of water for domestic use, Treatment for domestic use(break point chlorination); Treatment of brackish water(reverse osmosis, electrodialysis using ion selective membrane). Water quality parameters: Acidity, alkalinity, BOD, COD, Dissolved oxygen, Conductivity, pH.

Polymer Sciences: Elementary ideas about polymers, Classification of polymers, Types of polymerization, Determination of average molecular mass of polymers. Chemical reaction for the synthesis of polymers: Teflon, PMMA, Polyester-(Dacron), Nylon6, 6; Novalac, Phenol formaldehyde resin (Bakelite), PC (Polycarbonate). Classification of Electroactive Polymers, Application of polymers in various devices (Electronic, Computer and Mechanical): Electro active polymer, Ferroelectric Polymer, Biodegradable polymer as orthopedic devices, conducting polymers. **Liquid Crystal Technology:** Introduction, Classification of liquid crystals: Smetic liquid crystal, Nematic liquid crystal, Cholestic liquid crystal, Principle of liquid crystal Display (LCD), Different liquid crystal display materials, Polymer dispersed LCD – Molecular arrangement in various types of liquid crystals.

Phase Equilibrium: Introduction, Gibbs phase rule, Application of phase rule in one component system, Water system, Carbon dioxide system, Sulfur system Condensed phase rule, two component system, Eutectic mixture, Lead silver system. Two component system: Potassium iodide -water system, Ferric chloride water system and Iron-Carbon system.

Battery Technology: Introduction, Numericals based on EMF of cell, Relationship between e.m.f. and Thermodynamic properties (ΔH, ΔS, ΔG), Electroless plating, Preparation of PCB (Printed circuit board), Dry cell, lead storage batteries. Applications and function of batteries used in Laptops: Lithium ion battery, NiMH battery, Nano battery, Gel battery. Batteries used in rockets & submarine, Fuel cell (hydrogen-oxygen alkaline fuel cell, molten carbonate fuel cell, Phosphoric acid fuel cell) Batteries used in electronic devices, Solar cell.

Corrosion and its control: Introduction, Causes of corrosion, effects of corrosion, Types and mechanism of corrosion, Direct chemical (dry) corrosion. Electrochemical (wet) corrosion, Comparison of Chemical and electrochemical corrosion. Types of electrochemical corrosion, Other forms of corrosion (Underground or soil corrosion, Microbial corrosion, Erosion corrosion, Intergranular, Crevice, atmospheric corrosion), Passivity of corrosion, Factors

influencing corrosion**:** Nature of the metal, Nature of corroding environment, Prevention of corrosion, Use of protective measurements-Cathodic protection.

Green Chemistry and Green Engineering: Introduction, Principles of green chemistry and Green Engineering, Green Reagents- Polymer supported reagents, Green Chemistry in India (examples of Microwave assisted synthesis), Traditional and alternative synthesis of Ibuprofen, Adipic acid, Urethane.

CHP1101 Engineering Chemistry Lab

Course Learning Outcomes

CLO1 learn and apply basic techniques used in chemistry laboratory for small/large scale water analyses/purification.

CLO2 be able estimate the ions/metal ions present in domestic/industry waste water.

CLO3 utilize the fundamental laboratory techniques for analyses such as titrations, separation/purification and spectroscopy.

CLO4 able to analyze and gain experimental skill.

Determination of total hardness, permanent hardness and temporary hardness by Complex metric method. Determination of residual chlorine in water. Determination of dissolved oxygen in the given water sample. To determine Biological Oxygen Demand in the given water sample. To draw the chemical equations of Traditional and Green synthesis of Adipic acid using CHEM SKETCH. To study the electro-optic behavior of liquid crystal cell. Preparation of Bakelite using phenol-formaldehyde. Preparation of urea –formaldehyde resin. Preparation of copper ammonia Complex. To determine the acid strength by using pH meter. To determine the acid strength by using conductometer. To determine the surface tension by drop number method using Stalagmometer. To determine the % moisture, volatile, ash and carbon content of coal sample by proximate method.

MEW2101 Manufacturing Practice

Introduction to manufacturing: set up and course requirement; work culture; safety requirements; fire, firefighting & accident handling; and first aid. Hands on practice in the following works area- Carpentry Shop, Fitting Shop, Sheet Metal Shop, Machine Shop, Welding Shop, Electrical & Electronic Shop, Computer Work Bench.

Carpentry Shop: Various types of timber and practice boards, defects in timber, seasoning of wood; tools, wood operation and various joints; exercises involving use of important carpentry tools to practice various operations and making joints.

Fitting Shop: Introduction of fitting practice and tools used in fitting shop; exercise involving marking, cutting, fitting practice (Right Angles), male-Female mating parts practice, trapping practice.

Sheet Metal Shop: Development of surfaces of various objects; sheet metal

forming and joining operations, joints, soldering and brazing; exercises involving use of sheet metal forming operations for small joints.

Machine Shop: Introduction to various machine tools, grinders etc; cutting tools and operations; exercises involving lathe, various tools used on lathe, drilling m/c, grinder etc.

Welding Shop: Introduction to different welding methods; welding equipment; electrodes; welding joints; welding defects; exercises involving use of gas/ electric arc welding.

Electrical & Electronic Shop: Electrical: Introduction to electrical wiring; Testing tools and apparatus. Electronic: Introduction to electronic components (Diode, Resistor, Transistors, Capacitors, LED's, PCB's etc) Preparation of PCBs involving soldering applied to electronic applications. Introduction to tools & test apparatus, troubleshooting of electronic circuits.

Computer Bench Work: Introduction to computer Hardware & peripherals Parts-Motherboard, Processor, Socket types, Input/output ports, Memory (primary, secondary), hard disc, CD/DVD drive, key board, mouse, SMPS. Assembling/Dissembling and Fault identification: SMPS function and power distribution, testing (using multi meter), part connectivity, error correction and detection. Introduction to advance technology and current wireless technologies (laptop component identification, Bluetooth, Wi Fi RF, IRDA etc.)

MEL4102 Engineering Graphics

Course Outcomes

1. To know and understand the conventions and the method of engineering drawing.
2. Interpret engineering drawings using fundamental technical mathematics.
3. Construct basic and intermediate geometry.
4. To improve their visualization skills so that they can apply these skill in developing new products.
5. To improve their technical communication skill in the form of communicative drawings.
6. Comprehend the theory of projection.

Drawing Techniques: Various types of lines, principles of dimensioning, size and location dimensions, symbols, conventions, scales (plane and diagonal) and lettering as per IS code of practice (SP-46) for general Engineering Drawing. Practice of drawing various types of lines and dimensioning exercises. Drawing exercises pertaining to Symbols, Conventions and exercises on lettering techniques free hand printing of letters and numerals in 5 mm sizes, vertical and inclined.

Projection of Points and Lines: Concept of horizontal and vertical planes. First and third angle projections; projection of points and lines, true lengths of lines and their horizontal and vertical traces. Projection of Planes: projection of planes and

their traces.

Projection of Solids: Projection of Right solids; solids of rotation and polyhedrons etc, Projection of solids with cases when (a) inclined to one ref plane and (b)inclined to both ref planes. Sectioning of solids. Principles of sectioning, types of sectioning, and their practice on projection of solids, sectioning by auxiliary planes. isometric projections and Orthographic projections- Concept of isometric views; isometric scale and exercises on isometric views. Practice in orthographic projections.

Development of Surfaces: Development of surfaces of cylinders, cones, pyramids and prisms.

MEP1102 Engineering Graphics Lab

Introduction of the CAD (computer aided drafting) software and its utilities in the engineering software. Study of the various toolbar options and exercises to familiarize all the drawing tools. Study the basic initial setting and viewing of the drafting software interfaces. Use of basic entities in 2D. Uses of various modify commands of the drafting software. Dimensioning in 2D and 3D entries. Study and implementation of coordinate systems.

EEL4103 Basics of Electrical Engineering

- **CLO 01:** Computation of various electrical quantities in D.C circuits containing Series and parallel connections of components with the help of, Kirchoff's current and voltage laws, mesh and nodal analysis.
- **CLO 02:** To analyze and characterize basic RL, RC & RLC circuits and implementation of electrical fundamentals rules.
- **CLO 03:** Apply fundamental rules/principles of magnetic effects, electromagnetism with the use of basic electrical elements.
- **CLO 04:** Describe the basic working principle and construction of different types of Transformer, DC motor and Induction motor.
- **CLO 05:** Give details of the concepts of electrical measuring instruments and various transducers functionality and their use in day to day applications.

Analysis of AC Circuits: Introduction to Alternating Voltage and Current—Waveform terms and Definitions. Root mean square, peak value, average value of A.C, phasor representation, and rectangular and polar forms of alternating quantities. Analysis of pure resistive, inductive and capacitive circuits. Analysis of series R-L, R-C and R-L-C circuits. AC power calculations for single phase. Analysis of parallel circuits, Power in AC circuits, Resonance in series circuit. Introduction to three phase systems-types of connections, relationship between line and phase values, AC power calculations for three phase systems.

Magnetic Circuits: Definition of emf, mmf, flux and reluctance, Faraday's laws, self and mutual inductance, Energy in linear magnetic systems, coils connected in series, electromagnets.

Electric Machines: DC Motors- Working principle, construction and applications of DC Motors. Three-phase and Single-phase induction motor- Principle, construction, working and applications.

Measuring Instruments and Transducers: Classification of Instruments, Principle of Indicating Instruments, measurement errors. Transformer – Principle, construction, working, equivalent circuit, testing and efficiency. Classification of Transducers, Active and passive transducers, Displacement transducers- LVDT, Temperature Transducers- Resistance Temperature Detectors, thermocouples and Thermistors, Piezoelectric Transducers. Batteries: Types, construction, charging and maintenance of batteries.

Electrical Protection and Safety: Basic Protection Devices – Types and Rating of fuses, MCB's, ELCB and MCCB. Electrical shock and precautions against shock, Concept of earthing and various types of earthing.

EEP1103 Basics of Electrical Engineering Lab

- **CLO01:** Students would know the basics components of electrical elements, equipments and their functionality with applications.
- **CLO02:** Possess an ability to analyze and characterize the electrical equipment's and instruments basics for their implementation.
- **CLO03:** They would be able to measure power and power factor of ac circuits and understand three-phase star and delta connections with and without applying loads to calculate 3-phase power.
- **CLO04:** Possess an ability to perceive the concept of Fuse/MCB characteristics for different fault currents.

Practical Implementation of Theoretical Concepts.

ECL5101 Basics of Electronics Engineering

Course Outcomes

After successful completion of the course student will be able to

1. Understand the current voltage characteristics of semiconductor devices
2. Analyze dc circuits and relate ac models of semiconductor devices with their physical Operation,
3. Design and analyze of electronic circuits,
4. Evaluate frequency response to understand behavior of Electronics circuits.

Prerequisite: Elementary knowledge of Atoms & Nuclei, Semiconductor Materials- Intrinsic and Extrinsic Material.

Basic Electronic Components and DC Networks: Concept and various types of Resistors, Capacitors, Inductors, Relationship between voltage and current in perfect resistor, Capacitors, Inductors, their series and parallel combinations, Basic concepts; concepts of linear, nonlinear, active, passive, unilateral and bilateral

elements; ideal and practical voltage & current sources – conversion from one to the other. Ohm's Law, Kirchhoff's law – KCL and KVL, Resistive Networks - Current and Voltage Division rule, Introduction about Mesh and Nodal Analysis method (independent sources).

Semiconductor Physics: Bohr's Atomic structure, Classification of solid based on energy bands, Intrinsic and Extrinsic semiconductor, Effect of temperature on the conductivity of semiconductor, Bonds in semiconductor, conduction through n-type and p-type semiconductor, Formation of pn junction.

Semiconductor Devices: P-N Junction Diode, V-I Characteristics, Ideal Diode, Diode application as a switch, Rectifiers: Half Wave, Full Wave and Bridge Rectifiers, their efficiency, PIV, Peak voltage, rms voltage and average voltage, Zener Diode, Light Emitting Diode, Schottky Diode, Seven segment display, Bipolor Transistors : npn and pnp transistor, operational modes-active, saturation and cutoff mode, Introductory idea about CE, CB and CC configuration, VI characteristics of CE configuration, Transistor application as an amplifier and a switch, Junction Field Effect Transistor (JFET), SCR and UJT (Construction and Characteristics).

Digital Electronics: Number Systems (Decimal, Binary, Octal and hexadecimal), Conversion from binary number system to decimal number system and vice versa, 1's Complement and 2's complement, Binary Addition, Subtraction and Multiplication. Boolean algebra - Laws of Boolean algebra, Logic Gates, Basic gates, Universal Gates and special purpose gates with their truth table, symbols, logical expression, Realization of logical expression using basic and Universal gates, Flip- Flops- Latch, Basic SR flip-flop, truth table.

Integrated Circuits: Classification of ICs, Operational Amplifiers, its characteristics, IC 741 pin configuration, Ideal Op-amp characteristics, inverting amplifier, non-inverting amplifier, Differential amplifier (with Open loop configuration only) differential and common mode operation, common mode rejection ratio (CMRR), slew rate, IC Timer- IC 555 Timer Block Diagram, pin configuration, Basic modes of operation- bistable, monostable and stable, Waveform generation using astable configuration only.

ECP1101 Basics of Electronics Engineering Lab

Course Outcomes

After successful completion of the course student will be able to

1. Develop a digital logic and apply it to solve real life problems.
2. Analyze, design and implement combinational logic circuits.
3. Classify different semiconductor memories.
4. Analyze, design and implement sequential logic circuits.
5. Understand the fundamentals and areas of applications for the integrated circuits

Practical Implementation of Theoretical Concepts.

ECL4207 Digital Electronics and Logic Design

- **CLO1:** Understand the basics of difference between analog and digital circuits and their applications.
- **CLO2:** To implement simple logical operations required for the designing of digital circuits and understand common forms of number representation.
- **CLO3:** Reduction of Boolean expressions for the designing of minimized logical circuits.
- **CLO4:** Design and implementation of combinational circuits.
- **CLO5:** Design and implementation of sequential circuits and their application.

Introduction: Binary Numbers, Number Base Conversions (Octal and Hexadecimal Numbers etc, Complements, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, Binary Logic, Definitions- Basic Theorems and Properties of Boolean algebra, Boolean Functions, Canonical and Standard Form.

Gate and Circuits: Digital Logic Gates, Integrated Circuits, ADC and DAC.

Mapping: The Map Method (Four – Variable Map n Five –Variable Map) Quine MC Cluskey Method, Product of Sums Simplification, Don't care conditions, NAND and NOR Implementation Other Two Level Implementation, Exclusive-OR Function.

Combinational Circuits: Combinational circuits, Analysis Procedure, Design Procedure, Binary Adder-subtract or, decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoder, Multiplexers & demultiplexer.

Registers and flip Flops: Sequential Circuits, Latches, Flip-flops, Conversion of Flip –flops, Analysis of Clocked Sequential circuits, State Reduction and Assignment, Design Procedure. Registers, Shift Registers, Ripple Counters Synchronous Counters, Other Counters.

Memory: Random-Access Memory, Memory Decoding, Error-Detection and Correction Read Only Memory Programmable Logic Array, Programmable Array Logic Sequential Programmable Devices (SPLD, CPLD, FPGA).

Basics of Circuits: Basic Characteristics of RTL, DTL, TTL, ECL, MOS and CMOS circuits

ECP1207 Digital Electronics and Logic Design Lab

CLO1: Posses the ability to understand digital circuits and their applications.
CLO2: To understand the digital logic and create various systems by using these logics.
CLO3: Developing and understanding of design and simulation of digital logic circuits.
CLO4: Analyzing the basic understanding of layout of electronic circuits.
CLO5: We will use Multisim 11.0 tools for design and simulation.
CLO6: This lab introduces students to Multisim 11.0 tool.

Truth Table vérification Multiplexer/ De Multiplexer, Truth Tables of Half Adder/

Full Adder circuits using gates, Design and Test of SR/JK Flops, Study of D Flip Flop, Study of 2 bit and 4 bit asynchronous and synchronous counters, Truth Table verification of TTL gates, Fabrication of TTL Clocks.

CS101 Introduction to C Programming

CLO1: Analyze the problem statement.

CLO2: Choose the appropriate C programming constructs to solve the problems.

CLO3: Demonstrate the advantages and disadvantages of specific techniques to be used.

CLO4: Differentiate between efficient and inefficient way of programming.

CLO5: Determine and demonstrate bugs in a program and recognize needed basic operations.

CLO6: Formulate new solutions for programming problems or improve existing code to program effectively.

Introduction: Structure of a c program, Compilation, Linking & Execution, Comments in C,

Identifiers: Nomenclature of an Identifier, Variables, Constants,
Reserved Keywords Pre-processor directives: #define, #include.

Data Types: Introduction Initialization and Declaration of Data Type, Expressions, Statements, Symbolic Constants, Type, Memory representation of integer, character and float data types., Conversion / Type Casting, Input Output in C: Introduction, scanf(), printf( )

Operators: Arithmetic, Relational, Logical, Assignment, Conditional, bitwise, sizeof, Precedence of operators and their associativity.

Control Statements: Selection control Statements: if, if – else, Switch. Iteration control Statements: while, do – while, for, Nested loops, Continue, break. Introduction to complexity analysis

Functions and Pointers: Functions - User defined functions, Built-in functions. Pointers: Introduction to pointer, Pointer expression and pointer Arithmetic, Assignment, Value finding (dereferencing), Taking a pointer address, Adding an integer to a pointer, null pointer, void pointer generic pointer. Function parameter passing mechanisms: call by value, call by reference. Recursion. Storage classes: auto, register, static, extern

Arrays: Types of Arrays, 1-D Arrays: Introduction, Need & Importance
Dynamic memory Allocation in c Initialization of arrays, inputting values, assigning Values Passing 1-D to Function Representing 1-D arrays as pointer Arrays of pointers, pointer to an array Function pointer in C Multi-Dimensional Arrays: Declaration of 2-D Array, Initialization of 2-D Array, passing 2-D array to function Representing 2-D arrays as pointer

Strings: Introduction, Reading and writing strings, String functions(Predefined) : isalpha(), isdigit(), isspace(),strcat(),

strncat(),strcpy(),strncpy(),strlen(),strlwr(),strupr(),strchr(),strcmp(),strstr() Pointers and Strings Passing string to a function Array of Strings: Introduction, Reading and writing strings Pointers and Strings Passing string to a function

Structure and Union: Structure – Declaring Structure, Accessing members of Structure, Copying Structure, Accessing Structure elements, Nested Structure, Array of structure, passing structure elements to a function individually, Passing entire structure to a function, Pointer to structure, Passing pointer of structure to function. Union. Bit Fields in c. Enum in c. typedef. Command line arguments.

CS102 Object Oriented Programming Using C++

CLO1: Analyze the problem statement.

CLO2: Choose the appropriate OOPs programming constructs to solve the problems.

CLO3: Demonstrate the advantages and disadvantages of specific techniques to be used.

CLO4: Differentiate between efficient and inefficient way of programming.

CLO5: Determine and demonstrate bugs in a program and recognize needed basic operations.

CLO6: Formulate new solutions for programming problems or improve existing code to program effectively.

Introduction to Object Oriented Programming: Structure of C++ program, Keywords, Basic Data Types, Derived Data Types, Declaration of Variables, Operators in C++, Scope Resolution Operator, Control Structure, Actual & Formal arguments, Default Arguments, Storage Class Specifiers, Functions, Arrays Declaration, Initialization, Processing Arrays, Arrays and Functions, Character Array, Pointers declaration, Pointer Arithmetic, Pointers And Function, Pointers And Arrays.

Classes: Class Declaration, Member functions, Inline Function, Arrays within class, Static data, Static member functions, Friend Functions, Friend class, Constructors, Parameterized constructor, Multiple Constructor, Copy Constructor, Destructor, Dynamic memory Allocation.

Overloading: Operator Overloading, Overloading assignment operator, overloading arithmetic operator, Overloading comparison operator, Function Overloading.

Inheritance: Hierarchical, Hybrid, Single Inheritance, Multilevel Inheritance, Multiple Inheritance, Advantages & Disadvantages of Inheritance, Virtual Functions, Pure Virtual Functions, Virtual Base class, Abstract Class Templates, Function Template, Class Template.

Files: File Stream, Opening and Closing Files, File modes, Sequential Input output, Random Access Files, Updating Files, Exception Handling, Graphic Functions in C++.

CSP3213 Introduction to LINUX

- CLO1: Students will learn the installation and basic handling of Linux System.
- CLO2: Students will learn different distributions in Linux and its terminology and implement the different Linux commands.
- CLO3: Students will be able to handle the file system used in Linux operating system and its architecture.
- CLO4: Students can create new users accounts in Linux operating system using different commands.
- CLO5: Students can implement the shell scripts using vi editor and different editors used in Linux.

Introduction: Linux Foundation, Linux Requirements, Linux Philosophy and Components, Linux History, Linux Community, Linux Terminology, Linux Distributions.

Installation: Configuration & Customizations of Unix/Linux, Linux Structure and Installation, Linux file-system basics, The boot process, Linux Distributions Installation.

Introduction to GCC compiler: Compilation of program, Execution of program.

Study basic & User status Unix/Linux Commands: Purpose commands: man, help, history, who, whoami, id, uname, tty, usermod.

System Configuration from the Graphical Interface: System, Display, Time and Date Settings, Network Manager, Installing and Updating Software

Command-line Operations: Command Line Mode Options, Basic Operations, Installing Software**,** terminals, types of terminals, switching between terminals.

Working with Files: cat, cp, mv, rm.Compressing files- tar, gzip, compress, uncompress, file

Directory oriented commands: cd, pwd, mkdir, rmdir, ls and its options.

Searching: Search file or directory in directory structure using find and locate command with various options, wildcards. Mounting- mount, umount. USB, CD/DVD.

GCC: Working with GCC compiler, debugging, time-stamping, compiling object files etc.

File system: Introduction to File system, File system Architecture, Comparing Files and File Types. Text Editors- Basic Editors: nano and gedit, More Advanced Editors: vi and emacs.

Communication-oriented commands: echo, host, nslookup, ipcalc, ping, traceroute, netstat. whois, finger, ifconfig, telnet, wget, ip, route, iptables, write, mesg, mail.

Managing Users: Adding user, removing user using the sudo command.

Local Security Principles: Understanding Linux Security, Understand the Uses of root, Using the sudo Command, Working with Passwords, permissions modification using chmod, Chown, chgrp.

Network Operations: Introduction to Networking, Browsers, graphical and non-graphical browser, Transferring Files, Process oriented commands-ps, pstree, kill, killall (with all their options), Process scheduling-at, cron.

Regular expressions, redirections & Filters in Linux: Simple filters viz. more, wc, diff, sort, uniq, etc., grep, > , >Bash Shell Scripting- Features and Capabilities, Syntax, Constructs using expr, tr. Simulating an array using eval.Write Script to find out biggest number from given three nos. Nos are supplies as command line argument. Print error if sufficient arguments are not supplied

Advanced Bash Shell Scripting: String Manipulation, Boolean Expressions, File Tests, Case Structure, Debugging.Write Script, using case statement to perform basic math operation as Follows- addition, subtraction, multiplication, division Write script to print given numbers sum of all digit, For eg. If no is 123 it's sum of all digit will be 1+2+3 = 6 Printing- Configuration, Printing Operations.

CSL4207 Operating System

Introduction: Multi-Processor, Multi Programming, Multi-tasking, shell, kernel, Installation of linux (any version) System Components, Operating system services, System Calls- adding system call to linux kernel.

Processes: Process concepts, Process scheduling, operations on processes, cooperating processes, IPC Threading, Multi-threading, advantages of multi-threading, multithreading models-one to one, one to many, many to one, many to many.

CPU Scheduling: Basic concepts, Scheduling Criteria, Scheduling Algorithms-FCFS, SJF, Priority Scheduling, Round robin, Multi-level queue scheduling, multilevel feedback queue scheduling.

Process Synchronization: race condition, critical section problem, synchronization hardware, semaphores, classic problems of synchronization.

Deadlocks: System model, Deadlock characterization, methods of handling deadlocks- deadlock detection, prevention, avoidance, recovery from deadlocks.

Memory management: Swapping, Contiguous memory allocation, paging, segmentation, segmentation with paging, Demand paging, Process Creation, Page replacement, Thrashing.

File system concepts: Access methods, Directory Structures, File system mounting, file sharing. File system Implementation: File system structures, File system implementation, Directory Implementation, allocation methods, Free space management, Efficiency and performance, Recovery.

CSL3203 Computer Networks

CLO01: Describe and analyze the hardware, software, components of a network and the interrelations.

CLO02: Explain networking protocols and their hierarchical relationship hardware and software. Compare protocol models and select appropriate protocols for a particular design.

CLO03: Manage multiple operating systems, systems software, network services and security. Evaluate and compare systems software and emerging technologies.

CLO04: Explain concepts and theories of networking and apply them to various situations, classifying networks, analyzing performance and implementing new technologies.

CLO05: Identify infrastructure components and the roles they serve, and design infrastructure including devices, topologies, protocols, systems software, management and security. Analyze performance of enterprise network systems.

CLO06: Effectively communicate technical information verbally, in writing, and in presentations.

Introduction: Uses of Computer Networks, Network Hardware, Network Software, Seven-layer OSI architecture of ISO, concepts of layer protocols and layer interfaces, TCP/IP reference model, comparison of OSI &TCP/IP reference models,

Physical Layer: Transmission media, telephone system (structure, trunks, multiplexing and switching), wireless transmission,

Data Link Layer: Design Issues, Error detection and correction, elementary data link protocols, sliding window protocols, Medium Access Sub layer: The channel allocation, IEEE standards 802 for LAN & MAN,

Network Layer: Design issues, routing algorithms, routing protocols (static and dynamic): RIPv2, OSPF, EIGRP, NAT, ACL, Congestion control Algorithms, IP, Protocol, IP addresses, Subnets.

Transport Layer: Transport Services, Elements of Transport protocols, TCP service Model, protocol, Header.

Application Layer: Network security, DNS, SMTP, FTP, POP3 HTTP, world wide web, multimedia.

CSP2203 Computer Networks Lab

CLO1: Describe and analyze the hardware, software, components of a network and the interrelations.

CLO2: Explain networking protocols and their hierarchical relationship hardware and software. Compare protocol models and select appropriate protocols for a particular design.

CLO3: Manage multiple operating systems, systems software, network services and security. Evaluate and compare systems software and emerging technologies.

CLO4: Explain concepts and theories of networking and apply them to various situations, classifying networks, analyzing performance and implementing new technologies.

CLO5: Identify infrastructure components and the roles they serve, and design infrastructure including devices, topologies, protocols, systems software, management and

security. Analyze performance of enterprise network systems.

CLO6: Effectively communicate technical information verbally, in writing, and in presentations.

Introduction to computer network devices, Cabling and Connecting Computers through Cross cables, Introduction to Wire-shark, how to capture packets in Wire-shark, Subnetting – Class C, B and A, VLSM, Connecting Computers through Switches

CSL4209 Client-Side technologies

Web Programming and HTML: Introduction to web programming, Basics of HTML, understanding Document-Tags, TEXT: Methods of formatting text: font tag, inline text attribute, Bold and italic, super script, subscript, Lists: Ordered, Unordered, Definition Lists and introduction to Link. **Links:** The anchor element. Internal linking and external linking Attribute- href, Target, Name, Images: Image basics, image tag Image alignment, image map, tags (img map, area) respective all Attributes, Table and Frame in HTML:

Tables: Tag, width and alignment, Cell spacing and Cell padding, Cell alignment, Borders and rules, Rows, cells, Rowspan and Colspan attributes, Header, Footer and body sections, Captions and Background images in tables.

Forms: Creating a Basic Form Add a Text Box to a Form, Add Check Boxes to a Form, radio buttons, Adding Password, pull down menus to a form, use of clickable

- **CLO1**: Identify the basis of designing a Web site; create Web pages, links, images, tables and pages layouts in HTML.
- **CLO2**: Describe and identify the use of JavaScript and successfully place it into Web pages and also recognize the uses of JavaScript.
- **CLO3**: Use JavaScript to manipulate elements in the DOM to change appearance and visibility.
- CLO4: Describe how intended website design features will specifically benefit a target user group content strategy.

image as a submit button, Pass information between forms (action, method), meta data. Introduction to Frameset Tag, Frame Tag.

DHTML & CSS: Introduction, Technologies of DHTML – CSS and JavaScript, CSS: Syntax, CSS Id and Class, Ways to Insert CSS: External Style Sheet, Internal Style Sheet, Inline Styles, CSS Background, Background Color Background Image: - Repeat Horizontally or Vertically, Set position and no-repeat, CSS Text: Text Color, Text Alignment, Text Decoration, Font: Style, Family, Size, CSS Tables: Table Borders, Collapse Borders, Table Width and Height ,Table Text Alignment, Table Padding, Table Color, CSS Border: Style, Width, Color, CSS Margin: Margin, Padding.

JavaScript Introduction: History of JavaScript, Different Implementations, Determining the Document Object Model, uses for JavaScript, Incorporating

JavaScript in Your Documents. The JavaScript Language: Basic JavaScript Syntax, Data Types and Variables, Calculations and Operators. Control Structures: Do While, While, For and For In, If Else, Switch, Break and Continue; Labels, Built-in Functions, User-Defined Functions, Objects: Built-in Objects, User-Created Objects; Event Handling, JavaScript Errors and Troubleshooting, Document Object Model: History of the DOM, Understanding the Document Object Model, DOM Node Properties and Methods, Traversing a Document's Nodes, Changing Nodes, JavaScript Objects- Built-in JavaScript Objects- Window Object, Document Object, Form Object, Location Object, History Object, The Self Object; Accessing an Element by Its ID. Examples- Writing Text to a Document, Using Other Windows, Images, Working with Forms, Dynamic HTML Tricks.

CSP3209 Client-Side Technologies Lab

To implement HTML Tags, Text Formatting, To implement Lists in HTML, To create hyperlinks and add images, To create Tables in HTML, To implement Forms and frames in HTML, Work with CSS, Java Script – Control Statements, Objects, functions, event handling, To implement Java Script Objects.

CSL3307 Software Engineering

- **CLO01:** Acquire strong fundamental knowledge in science, mathematics, fundamentals of computer science, software engineering and multidisciplinary engineering to begin in practice as a software engineer.
- **CLO02:** Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.
- **CLO03:** Deliver quality software products by possessing the leadership skills as an individual or contributing to the team development and demonstrating effective and modern working strategies by applying both communication and negotiation management skill.
- **CLO04:** Apply new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects and evolving into their continuous professional development.

Introduction to Software Engineering: The Evolving Role of Software, Changing nature of software, The Software Process: Software Engineering –Layered Technology.

Process Models: The Waterfall Model Evolutionary Process Models – Incremental Models, Spiral Model

Requirements Engineering: Requirements Engineering Tasks, Initiating Requirement, engineering Process, Eliciting Requirements, Developing Use Cases.

Building Analysis Model: Requirement Analysis, Data modeling Concepts, Flow Oriented Modeling, Software Testing Strategies and Tactics-A strategic approach

for Software Testing, Unit Testing, Integration Testing, Validation Testing, System Testing White-Box Testing Techniques Basis Path Testing, Control Structure Testing Black -Box Testing Techniques- Equivalence Partitioning and Boundary Value Analysis

Project Management & Metrics: The management spectrum, Metrics for process & project, Metrics for Software Quality Estimation-Objective of Software Project Planning, Software Scope and Resources, Software Project Estimation and Decomposition Techniques (LOC, FP) Empirical Estimation Models: COCOMO Model

Project Scheduling: Basic Concepts of Scheduling, Project Scheduling, Earned Value Analysis

Risk Management: Software Risks & Risk Strategies, Risk Identification, Risk Projection, Risk Mitigation, Monitoring and Management (RMMM) plan Overview of Quality Management and Change Management

CSP1307 Software Engineering Lab

Introduction to UML and RSA (Rational software architect), Use-case Diagram of Management System and college Information System, Class diagram for Hospital Management System and College Information System, Interaction diagrams for College information system, Activity diagram for Bug Removal System and Admission Enrollment, Implementation diagram for University Information System and Hospital Management System.

CSL4206 Database Management System

CLO01: Design and implement database system by implementing SQL commands for RDBMS and analyze database requirements to determine the entities involved in the system and their relationship to one another.

CLO02: Describe relational algebra expression and tuple relation expression from queries.

CLO03: Implement the concept of normalization and functional dependency while designing the databases.

CLO04: Apply the concept of transaction, concurrency control, security and recovery in database.

CLO05: Implement procedures, functions, cursors and triggers and become proficient in PL/SQL programming.

CLO06: Explain and evaluate the fundamental theories and requirements that influence the design of distributed database systems.

Introduction to database: Characteristics of Data Base approach. Advantages and Disadvantages of DBMS approach, Introduction to Data Models- Hierarchical Model, Network Model, ER Model, Relational Model, Schemas- Instances, 3 Schema architecture and Data Independence. Client Server Architecture for DBMS.

ER Model: Data base design process, Entity Types, Entity sets, Attributes, keys and

their types, Weak entity types, ER diagrams, naming convention and design issues, E.F Codd Rules.

Relational Model: Basic concept, Characteristics of relations, Relational Algebra - Unary operation Relation, Relational Algebra Operations from Set Theory, Binary Relational Operations (Join, Division), Aggregate Functions and Grouping, The Tuple Relational Calculus, Query by example, Introduction to Normalization, their practical uses. Functional Dependencies (Fully, Transitive, Multivalve, Join Dependencies), 1st Normal Form, 2nd Normal Form, 3rd Normal Form, Boyce Codd Normal Form (BCNF), 4th Normal Form, 5th Normal Form, 6th Normal Form.

Transaction: Introduction to Transaction and its desirable properties. System Log, Characterizing Schedules Based on Recoverability and Serializability, Concurrency Control Techniques: Two Phase Locking Techniques for Concurrency Control, Concurrency Control based on Timestamp Ordering, Dealing with Deadlocks, Introduction to Database.

Recovery Techniques: Recovery techniques based on deferred update and recovery techniques based on Immediate Update. Introduction to Checkpoints and Shadow Paging, Introduction to Database Security, Discretionary access control based on granting and revoking privileges.

CSP 2206 Database Management System Lab

Introduction to SQL and architecture of database (tool to be used), Using DDL, DML, DCL commands, Exploring select clause and its single row functions, group functions, implement nested and co-related queries, Table Creation and alteration, Insert, Update and delete, Views

CSL2301 Advanced Database Management Systems

- **CLO1:** To make student familiar with basic concepts of advanced database concepts of advanced database management system and understanding database concepts and structures.
- **CLO2:** Students would be able to understand the role and importance of ADBMS with the help of live database example.
- **CLO3:** Over this, entire course is designed to help students to understand data modelling and database development process, construct and normalize conceptual data models.
- **CLO4:** Implement a relational database into a database management system. Use of database management systems such as Oracle, SQL and become proficient in using PL / SQL.
- **CLO5:** Students will be able to design logic to automatically manage the database during any DML or DDL transaction and understand the issues related to database performance.

Introduction to Database Server Architecture: Review of DBMS and

Introduction to Database Server Architecture, SQL Performance Tools (Indexes, Views, Clusters, Sequences), PL/SQL concepts, Introduction to XML databases, Structured, Semi-structured, Unstructured data, XML hierarchical Data Model, XML Documents, XML DTD.

Introduction to XML databases: XML Schema, XML Languages, Distributed Databases, Introduction to Distributed Databases, Advantages and Functions of Distributed Databases, Data Fragmentation, Replication and allocation techniques for Distributed Database design, Types of Distributed Databases System (Homogeneous and Heterogeneous), Parallel DBMS vs Distributed

DBMS, Distributed DBMS architectures, Client-server architecture, peer to peer, Multi DBMS architecture (model with GCS, model without GCS).

Query processing overview, query processing problem, Layers of query processing, Query Processing in Distributed Databases: Query Decomposition, Normalization, Analysis, Elimination of Redundancy, Rewriting.

Introduction to Data Warehousing and OLAP: Data Warehouse, Introduction to Data Warehousing, Conceptual Structure of Data Warehouse, Data Warehouse Modeling, Data Cube and OLAP Operations, Data Mart, OLTP vs OLAP, OLAP vs ROLAP vs MOLAP, Data Mining concepts, Introduction to Mining, KDD Process, Types of Knowledge, Association Rules (Market- Basket Analysis, A-priori Algorithm).

Association Rules, Sampling Algorithm, FP-Growth Algorithm and Partition Algorithm.

CSP2301 Advanced Database Management Lab

Practical Implementation of Theoretical Concepts. Use all concepts of PL/SQL.

CS109 Core Java

- **CLO1**: Implement the concept of object oriented techniques and methodologies using Java
- **CLO2**: Use Exception Handling concepts for a Robust Application in Java.
- **CLO3**: Demonstrate an understanding of Java Input and Output
- **CLO4:** Develop applications using multithreading concept of Java.
- **CLO5**: Use and Implement several Data structures using Collection Framework
- **CLO6**: Use database connectivity for a complete Java application.

Introduction: History and goals of Java, Fundamentals of OOPs, Overview of JDK, JVM, Garbage Collection, Working with Java Data Types, Using Operators

Looping Constructs & Arrays: Decision Constructs, Using Loop Constructs, Creating and Using Arrays (1D, 2D, Multidimensional) Jagged Arrays, Command Line Arguments. Practice Problems **Strings:** Introduction, Immutable String, Methods of String class, StringBuffer class &StringBuilder class, toString method, StringTokenizer class.

Classes, objects and methods: defining a class, Access Control, Method overloading, constructors, constructor overloading, use of this and static.
Working with Inheritance: Inheritance Basics & Types, using super, Method Overriding, Dynamic method dispatch, final keyword. Abstract: Methods & Classes, Packages & Interfaces.
Exception Handling: Exception handling fundamentals, Exception types, try and catch, multiple catch clauses, nested try, throw, throws and finally, Creating custom Exception. Practice problems.
IO Streams: Stream Classes: Byte Streams, Character Streams, StreamTokenizer. Practice Problems **Multithreading:** Java thread model, main thread, creating thread by implementing Runnable and extending thread class, creating multiple threads, using isAlive() and join(), thread priorities, Synchronization. **Generics:** Introduction, Generic Example, Generic Class, Generic Method, Generic Constructor and Generic Interfaces.
Collections Framework: Introduction, Collection Interfaces, Collection Classes, Iterator, Working with Maps: Map Interfaces & Classes, Comparators, Arrays, Vector, Stack, Dictionary, Hashtables.
JDBC Connectivity

CSL4349 Advance Java

Getting Started with Java, Conditionals and Loops, Operators and For Loop, Functions, Variables and their scope, Arrays, Searching and Sorting, Strings and 2D-Arrays, Object Oriented Programming, Recursion, Time and Space Complexity, Linked List, Stack and Queues, Trees (Binary Trees and Binary Search Trees), Hash Maps, Priority Queues, Tries and Huffman Coding, Dynamic Programing, Graphs.
system.

CS114 Data Structures

CLO01: Analyze algorithms and algorithm correctness.
CLO02: Analyze time complexities of algorithms using asymptotic analysis.
CLO03: Summarize searching and sorting techniques.
CLO04: Describe stack, queue and linked list operation. Compare different data structures and pick an appropriate data structure for a design situation.
CLO05: Explain the major graph and tree algorithms and their analysis. Employ graphs to model engineering problems.
Introduction: Basic Terminology, Elementary Data Organization, Data Structures and Operations Algorithm-Complexity, Time-Space Tradeoff, Asymptotic Notations for Complexity (θ, Ω, O).
Array: Introduction, Representation of Linear Arrays in Memory, Traversing Linear Arrays, Arrays: Inserting and Deleting (at Beginning, middle and at the end). Searching- Linear and Binary Search

with their Complexity, Sorting- Bubble Sort & its Complexity.

Linked List: Introduction & its memory representation, traversing a Linked List, Insertion into Linked List (sorted and unsorted Linked List), Deleting from Linked List, Operations on Doubly Linked List, Circular linked List & its applications.

Stacks & Queues: Array and Linked representation of Stacks, Implementations of recursive and non- recursive procedures by Stacks, Applications: Arithmetic Expressions, Polish Notation, Transforming Infix Expressions into Postfix Expressions, Queues: Representation as Array and Linked List Deques, Priority Queues, Sorting Techniques-Quick sort, Merge Sort, Radix Sort, Selection Sort, Insertion Sort & their complexity.

Trees: Binary trees, complete binary trees, Binary Search Trees, Data structures for representing binary trees. Insertion, deletion and searching in these trees. Tree Traversal- preorder, In order, Post order and their algorithms, Balanced binary Trees, AVL trees, insertion and Deletion in AVL tree, Heaps, Difference between heap and Array, insertion and deletion in heap. Heap sort and its applications.

Graphs: Basic terminology, directed and undirected graphs, notion of path. Representation of graphs: edge list structures, adjacency list structures, adjacency matrix. Linked List representation of Graph, Operations on Graph, Graph traversals: DFS, BFS.

Hashing: Techniques, Collision and its resolving.

CSL5302 Web Programming

CLO1: Students will learn to write basic codes in HTML and CSS and will be able how to create basic websites. They will learn about how to make the website more visually appealing using CSS.

CLO2: Students will be able to create interactive website which yield content dynamically with the help of JavaScript.

CLO3: Students will be able to make REST API calls to the backend server and integrate the response accordingly to the front-end.

CLO4: Students will be able to write applications using the React Framework and develop professional grade applications.

CLO5: Students will be able to use tools like webpack, babel, Google Chrome DevTools and Linters

Web programming: Introduction to web programming. HTML5: formatting tags, Lists, Linking between web pages, image in web page, Table tag with attributes, Frames, Form.

CSS3: Internal, external and Inline**,** Use of CSS in HTML document.

Bootstrap: Tables, Forms, Button, Images

JavaScript: Basics of javascript, expression, operator, control statement, functions, accessing HTML element using javasript, dialog box, Event handling, Form Validation.

JavaScript Objects: name, maths, string, date, array.
jQuery: Introduction to jQuery, jQuery Selectors, jQuery Events, jQuery Effects (Hide/Show, Fade, Slide, Animate, Stop), jquary element operation (Get, Set, Add, Remove, CSS)
AJAX: Basics, actions, XMLHttpRequest, Database operations
AngularJS: Introduction, Basic module, Directives, Model, Data Binding, Controllers, Scopes, Filters. Expressions, Data and HTTP Services, Tables, Events, Forms and Validation,File Structure, Animations, Testing. Development using GIT-clone, pull, push commands. Environment setup.
NodeJs: Basics, modules, Expressions, HTTP Module
File System, URL Module, NPM, Events Introduce Express - Express set up, Server Set up, Middleware Routing, Express Sessions, Templating, Passing Parameters, and Express APIs **MongoDB:** Introduction, Create database, Database operations (insert, find, query,Sort, Delete, Drop, Update, Join.

CSL5356 Front End Development

AJAX: Event loops and Browser APIs. AJAX, Misc. Hosting, Coercion, call, Apply, bind. Closure, lffe, event loop revisit, Event Loop Revisit
Typescript: Introduction to Typescript, using type scripts, elements **Angular:** Core Concepts, Angular Routing, Advanced CSS, Media Queries, **Bootstrap:** Introduction to Bootstrap, components of bootstrap

CSL5357 User Interface design

HTML, CSS and JavaScript: Intro to JS and Styling: HTML as markup language, Anatomy of HTML tags, Block vs Inline tags, Introduction to basic CSS and JavaScript. CSS Basics, Box Model, selector: CSS as stylesheet and how to import, Margin, Padding, Border, Types of CSS selectors and how to use them. Introduction to JavaScript: Variables, Data types, Comparison and Logical Operators, condition, Switch, Loops. Functions: Definition, types and invocation, Scope, IIFE and closure. Objects: Definition, Methods and properties, Constructors and prototypes, JSON, HTML DOM element manipulation and debugging: Events and navigation, Browser Object model introduction, Elements and methods, error and debugging, Style Guide, Performance and best practices.
jQuery: Introduction to jQuery: Library, DOM Manipulation with jQuery, Event Binding with jQuery, AJAX with jQuery.

EP3001 Entrepreneurship

Introduction: Entrepreneurship in Established Firms, Venture Creation's Role in Society, How Has Entrepreneurship Changed the World? What Is Entrepreneurship? Myths About Entrepreneur-ship, How Has Entrepreneurship Changed our Country? Our Local Heroes, Developing the Opportunity, Opportunity

Analysis, Class Activity: Dream It, Do It, E-cell to Entrepreneurship - Shashank's Story. Class Activity: Idea Planes, Markets, Need-Finding and Planning, Defining the Focal Market: Market Segmentation, Understanding User Needs, Competitive Analysis, Generating Ideas with Individuals and Groups

Global Legends – Introduction and Instructions, Video: TED Talks, Story of Travis Kalanick and Uber, Video: TED Talks, Story of Mark Zuckerberg and Facebook, Video: TED Talks, Story of Danae Ringelmann and Indiegogo, Video: Your Own Heroes – Introduction and Instructions, Video: INKtalks, Story of Kunal Bahl and Snapdeal , Video: INKtalks, Story of Varun Agarwal and Alma Mater, Video: INKtalks, Story of Phanindra, Opportunities and Uncertainty, Customers as Sources of Opportunities, Opportunity/Problem Identification, Differentiating problem & symptoms, Defining problem.

Design Thinking for customer delight: What Is Design Thinking? Class Activity: Design Thinking - Myth Buster, Video: Understanding Design Thinking – Concept, Class Activity: Keep It, Junk It!

Making the right choice (Idea generation), Generating Ideas with Individuals and Groups, Idea presentation, Team formation, Understanding User Needs, Customer validation, testing your Idea: Surveys, Competitive Analysis, USP, Role of incubator, Visit to incubator

Characteristics of a Successful Entrepreneur: Video: Entrepreneurial Styles Introduction, Class Activity: Entrepreneurial Styles Quiz, Video: Different Entrepreneurial Styles – Concept. Class Activity: Build It, Class Activity: Everything Is Not What It Seems, Class Discussion: Barriers to Communication, Video: Barriers to Communication Role-play –Class Activity: Tell-a-Story, Video: Active Listening , Class Discussion: Body Language Speaks Louder than Words, Video: All About Handshakes, Video: Body Language Speaks Louder than Words – Concept and Debrief, Video: Design Thinking Process, Class Activity: Backpack Redesign Activity.

Sales skills to become an effective Entrepreneur: Video: Customer Profiling – Introduction and Concept, Class Activity: Customer Pro-filing, Video: Types of Customers – Concept, Video: What is Wowing Your Customer? Class activity: Wowing your Customer, Video: Personal Selling – Concept and Process, Class Activity: Personal Selling, Video: Show and Tell – Concept, Class Activity: Show and Tell, Video: Elevator Pitch – Concept and Introduction, Class activity: Craft your Elevator Pitch, Video: Elevator Pitch – Debrief and Myths.

Managing risks and learning from Failure: Introduction to Risk-taking and Resilience, Class Activity: Managing Risks and Learning from Failure - Myth Buster, Video: Introduction to Risk and Resilience, Class Activity: Let's Discuss Risks, Video: Managing Risks, Class Activity: Understanding Risks Through Risk Takers, ARE YOU READY TO BE AN ENTREPRENEUR? Class Activity: The Big De-bate, Class Activity: Why Do I Do What I Do

CS113 Advanced Programming Concepts

CLO01: Formulate problem solutions by incorporating advanced C programming constructs.

CLO02: Choose the appropriate searching and sorting technique.

CLO03: Demonstrate the advantages and disadvantages of specific techniques to be used.

CLO04: Develop programs using basic data structures like stack and queue.

CLO05: Formulate new solutions for programming problems or improve existing code to program effectively.

Introduction: Structure of a C program, Compilation, Linking & Execution, Using comments, Identifiers- Nomenclature of an Identifier, Variables, Constants, Reserved Keywords.

Data Types: Introduction, Initialization, Declaration of Data Type, Expressions, Statements, Symbolic Constants, Type Conversion / Type Casting, Input Output in C- Introduction, scanf(), printf().

Operators: Arithmetic, Relational, Logical, Assignment, Conditional, size of, Precedence.

Decision Control Construct: Conditional Statements: if, if – else, Nested if –Else, switch, conditional operator, Looping- Types of Loops: while, do – while, for, Nested loops, Continue, break. **Functions:** User defined functions, Recursion, Storage classes.

Arrays: Introduction, Need & Importance, Types of Arrays: One Dimensional Arrays, Two Dimensional Arrays, Initialization of arrays, inputing values, assigning Values, Multi-Dimensional Arrays, Declaration of an Array, Initialization of an Array, passing 1d to Function, passing two- dimensional array to function, Sparse Matrix.

Strings: Reading and writing strings String functions Predefined), isalpah(), isdigit(), isspace(), strcat(), strncat(), strcpy(), strncpy(), strlen(), strncpy, Implementing user defined functions for Strcpy, strlen, strcmp, strlwr, strupr, strcat.

Pointers: Introduction to pointer: Pointer expression and pointer arithmetic Assignment, Value finding (dereferencing), Taking a pointer address, adding an integer to a pointer, incrementing a pointer, Pointers and strings Passing pointer to a function, Representing arrays as pointer, Arrays of pointers, Null pointers, Generic pointer, Dynamic Allocation of Arrays. Allocating block of memory, releasing the used block, alter the size of allocated memory, allocating memory to single dimensional array, Allocating memory to two dimensional arrays.

Structure: Declaring Structure Accessing members of Structure, Copying Structure Accessing Structure elements, Nested Structure Array of structure, passing structure elements to a function individually passing entire structure to a function. Union: Union Accessing member of Union Unions Inside structure, Pointer to structure, passing pointer of structure to function.

File Handling: File pointer, open file, close file Read data from file, fgetc(), fgets(), fscanf(), fprintf(), writing data from a file, fputc(), fputs(), fprintf(), fwrite() ,Difference between Text Mode, Binary Mode, Detecting End-of-file , Accepting command line arguments, Functions for selecting record randomly fseek(), ftell(), rewind(),Difference between Text Mode, Binary Mode, Detecting End-of-file Accepting command line arguments ,Functions for selecting record randomly fseek(), ftell(), rewind(). Preprocessor Directives. Base64 encoding, Boolean Algebra.

CSL4336 Algorithm Design & Implementation

Java Basics, Classes and Objects, Data Types and Operators, Methods and Classes, Introduction for generation of Random numbers, Inheritance, Packages and Interfaces,: Using I/O, Generics, Autoboxing, Static Import and Annotations, Graph primitives, DFS, BFS, Connected components, Directed and undirected Graphs, Balanced Search Trees and its applications, Hash Tables

CSL4306 Front End development using web development

Web programming basics- How internet works?-(Circuit Switch, Packet Switching, Protocol Layer- Application – HTTP, SMTP, Transmission Control, UDP, Internet Protocol, Hardware layer, DNS, Client Server communication, How Internet works - Developer angle, Load balancing, Node Server set up using vagrant), Client server communication, IP address and Ports, Protocols, Program Control Statements, I/O Basic. Revise UNIX Commands, Development using GIT-clone, pull, push commands.

Environment setup Front End Web development- Front End Programming-(Front end basics- HTML, HTML5, CSS3, Sublime editor usage), (Basics of Java Script- Editors used: Browser Console, Node), (Bootstrap- Responsive web design, Grid System for various screen sizes, Media only queries), (Debugging web page-Developers Tools), Google chrome features. HTTP Codes**.**

Introduction to NodeJS: Introduction to MEAN stack Front end Web development- CSS Frameworks, Bootstrap**,** Java Script basics**,** Introduce AJAX and JQUERY.

Angular JS- Why Angular ?**,** Angular in detail-(Basics Components, MVC introduction, Module, Directives , Controller, Scopes, Filters, Custom Directives, Promises, Routing- ngRoute, Ui-router,

$http service, Services, Dependency Injection, File Structure, Animations, Testing) Nodemon Debugging NodeJS code Introduce Express - Express set up, Server Set up, Middleware, Routing, Express Sessions, Templating, Passing Parameters, Express APIs.Introduce build process Nodejs in distributed mode Session management Project status. Object oriented JS Database- Introduction to database, Introduction to NOSQL, Working with Mongo DB.

Security and threats- SQL Injections, Cross Site Scripting (XSS), Broken Authentication & Session Management, Insecure Direct Object References, Security Misconfiguration, Cross-Site Request Forgery (CSRF) Doubts clearing Other client server models- just introduction, Java J2ee, Python Flask, jango.

JQuery topics: Introduction, $(document).ready(function() in jquery, Content delivery Network, Jquery selector, jQuery each function, jQuery method chaining, Convert JSON object to string, jQuery DOM manipulation methods, jQuery wrap elements jQuery append elements, jQuery insert element before and after, jQuery add or remove class

CSP2325 Operating System Essentials

Preliminaries-Hardware Logical View, ISA instructions, performance and storage structure overview.

Processes - Process Representation in Linux, multitasking, information sharing between processes, co-operating processes.

Threads - Difference between processes and threads, POSIX library overview, Parallelism, concurrency, Thread design models.

Virtual memory: Introduction, Physical v/s Virtual Addressing, memory Hierarchy, Address Translation, Page Hit, Page Fault, Locality, TLB, Simple Memory System Example, Hierarchical page tables.

Deadlocks -Deadlock avoidance, prevention strategies, Resource Allocation Graphs

Synchronization - Algorithms, OS synchronization constructs, Producer Consumer Examples **Scheduling** - CPU Scheduling, Scheduling strategies, run-queue data structure, scheduling for IO vs. CPU bound processes.

CSL4341 Python Basics

Introduction to Objects & Python's Math Library: Understanding variables and basic operations on number and string data, dealing with basics of math library (pow, sqrt, round, exp, pi, ceil, floor), displaying strings and numbers, while statement.

String: Understanding and Implementing string methods like upper(), lower(), isdigit(), isallnum(), isalpha(), isnumeric(), split(), endswith(), startswith(), join(), count(), strip() and exploring string iterations, basic if statement. Working with number literals, dealing with hexadecimal, octal and binary numbers, basic arithmetic operations, mix type conversion, integer to float and float to integer conversion, formatting numbers.

Lists: Creating empty list, initializing list, list indexing and slicing operations, input method, single and multidimensional arrays. Concatenating multiple lists, generating range based lists, list based methods like append(), extend(), insert(), index(), count(), sort(), reverse(), pop() and nested lists. Creating, initializing and accessing sets and tuples.

Dictionary: Creating empty dictionaries, initializing dictionaries, accessing

dictionary items, merging, and deletion. Understanding dictionary specific methods, keys (), values (), items (), copy (), update (), pop () and dictionary comprehension. Declaring and calling user defined methods, recursive calls and returning multiple values via return statement. Understanding local and global scopes, argument passing techniques (normal arguments: matched by position, keyword arguments: matched by name, default arguments, Using * and ** during calling time and receiving time. Creating classes, objects, attributes. Classes v/s dictionaries, constructors and idea of inheritance.

Modules: Creating user defined modules, importing existing modules, creating root windows and calling various dialog boxes on button click response. Dealing with text-boxes, list-boxes, menus and dealing with basic events. Performing insertion, Updation and deletion operation using python GUI.

CSQ1301 Cyber Security for Under Graduate – I

- To take reasonable steps to protect their IT/data systems and protect the privacy of their clients.
- To respond, resolve, and recover from cyber incidents and attacks through timely information sharing, collaboration, and action.
- To safeguard national critical information infrastructure (CII).

Introduction of Cyber Security: Information Security, Basic networking and TCP/IP, Introduction of Malwares, Attacks and Offensive Security, DHCP Explanation and ICMP basics & Blocking.

Virtualization: Introduction, Virtual Machines Explanation, Key Properties of VM, The connection of VM on the physical network. TCP: TCP Headers, TCP Flags.

Debian Hands-on: Installation, Connection with putty, Apache server Setup, File transfer by using WinSCP, Backup of VM.

Wireshark: Introduction, Basic Keywords, Wireshark packet capturing, Packet Analysis. **Internet Information Service (IIS):** IIS enabling, IIS website and FTP server configuration. **TCP headers**: TCP headers, TCP header demonstration on Wireshark.

IPTABLES: Introduction and Installation, Configuration. **NORT:** Introduction, Configuration and error-handling. **SNORT (WINDOWS):** Configuration on with Syslog, Syslog Practical.

SNORT (Linux): Installation and configuration

SDLC: Phases of SDLC Testing: Security, VA/PT Phases, Objectives, Roe Sample Templets, Reconnaissance Google Dorking: Mysql, Cfg, Rds.

Security Tools and sites: Whois, Site safety checking, The harvester, Hyperlink extraction, Nslookup, Netcraft Cryptography: Introduction and Goals, Types of Cryptography

Fingerprinting: Nslookup practical: Mail server search, Nameserver search, Entry point search, Subnet search, Nmap scan with and without root, how to get header

information of server, How to get Operating server details, Enumeration using nslookup

Cryptography: Symmetric-Key cryptography, Asymmetric-Key cryptography Hybrid, Key cryptography, Types of Cryptography, Asymmetric, Hashing Algorithms, Public Key Infrastructure (PKI), Digital Signature

System Vulnerability Test: Test by using, Nessus, CVE website.

Metasploit: Introduction, Payload creation, Exploit on windows, Metasploit commands demo

HTTP Basics: Versions of HTTP (1.1 & 1.0), HTTP response codes, HTTP authentication. Open Web Application Security Project (OWASP): OWASP Top 10, OWASP Testing guides

CTF Challenges: using SQL to solve a challenge, curl command in linux, WiFi Hacking.

CSQ3102 Cyber Security for Forensics and Investigations

- To take reasonable steps to protect their IT/data systems and protect the privacy of their clients.
- To respond, resolve, and recover from cyber incidents and attacks through timely information sharing, collaboration, and action.
- To safeguard national critical information infrastructure (CII).

Introduction: A brush up session of earlier Module covered in Cyber Security Module-1 CIA Tried with Case study, clearing earlier session doubted, Brief Demo on Cyber-attack. Introduction to Information Security-CIA Traid, Application Security, security misconfiguration, Introduction to cryptography, Digital signatures.

Introduction to Digital Forensics- Definition, Need, Cyber Crime Scenarios, Applicability and Expressiveness, Goals. Key Technical Concepts - a. Storage Types, b. Hard Disk Structure, Disk Technology: Flash Drives, HDDs, SSD, Difference between them, Data Organization (Sectors and Clusters), Booting Sequence. Cyber Laws and Case Studies. Key Technical Concepts- File System overview, Introduce NTFS, FAT, EXT3, EXT4. Explain Organization Structure, Importance, Allocated, Unallocated Space, Slack Space, Free Space, etc, Data Allocation, Deletion of FIle, Demo: FAT and NTFS File Deletion with InfoGraphics, Changes to Usn Journal. Data Carving / File Recovery, How and Why? e. File, f. Deleted vs. Wiped, Data Wiping: Why and How? Data Wiping Standards, Challenges, Tools + Demo. Forensic Image, Forensic Image Types: E01, AFF, DD, Difference and Efficiency. Digital Investigation Process Models. Sample Security Breach Scenario, Published Guidelines for Handling, Digital Crime Scenes."How Forensic Investigation works? Process, Rules, WriteBlockers, Precautions to be taken, Reconstructing the Scene".

Digital Investigation Process: "Sex Offenders on the Internet CyberStalking

Investigating Computer
Intrusions Forensic. Preservation of Volatile Data" Introduction to Standards, Frameworks and Guideline, Acquisition Types and Methods - Live forensics- Understanding Live Forensics and Live Data Acquisition. Introduction to Incident Response. Live RAM Analysis. Introduction to Volatility and Malware Hunting in RAM. Tools: FTK, OSF, RAM Capturer / Dumpit. Windows Artifacts Analysis: Thumb.db, Paging File, Hyberfil.sys, Prefetch file, Superfetch file, Recycle Bin, Registry, AppData. Acquisition Types and Methods - Non-Live forensic, Understanding Non-Live Forensics and Non-Live Evidence Acquisition. Windows Forensics Artifacts and Tools Demonstration with Importance. Tools to be Used: OSF, FTK, EnCase, NirsoftTools, Autopsy etc. Password Forensic: File, Zip and Windows password cracking and Bypass, Analyzing Server Logs: Introduction to Web Application and Web Servers, FTP Servers Logs. Web Server Logs. Sample Case, USB Device Forensics, Steganography and Tools

CSQ3103 Malware and Reverse Engineering-I

- To take reasonable steps to protect their IT/data systems and protect the privacy of their clients.
- To respond, resolve, and recover from cyber incidents and attacks through timely information sharing, collaboration, and action.
- To safeguard national critical information infrastructure (CII).

Introduction: Introduction to Malwares, RE & Malware Analysis Lab Setup Guide, Lab setup, Introduction to window internal, Window PE File format explanation. Assembly Programming Basics, Reverse Engineering Basics and Tool setup, Malware analysis static basic, Practical Reversing I – Malware Analysis, Practical Reversing II – Unpacking Malware. Malware dynamic analysis basic, Practical Reversing III, Malware dynamic analysis advance, Lab. Theory class of exploit development, Practical Reversing V – Exploit Development [basic],
Case study: Root kit. Detection and removal of Malwares, Window internals, C and C++ for reversing. Theory class of anti-reverse engineering technique, SDLC, Web application secure design. Secure System application design, Small antivirus using python, AV working. Malware Sandbox, Malware sandbox tool demo and analysis, Online sandbox. Lab on .NET based malware, Handle unknown file formats, Android malware analysis. Reversing Communications of a RAT, Decrypting Communications of a RAT, Dissecting the RAT Features. Doubt Session.

CSQ3104 Malware and Reverse Engineering-II

- To take reasonable steps to protect their IT/data systems and protect the privacy of their clients.

- To respond, resolve, and recover from cyber incidents and attacks through timely information sharing, collaboration, and action.
- To safeguard national critical information infrastructure (CII).

Introduction: Introduction to Malwares Analysis &Reverse Engineering, Malware Analysis Lab Setup Guide, Lab setup, Introduction to Malware, Types of Malware, Basic commands with NetCat, Basics of Computer Organization.

Types of Analysis: - Static & Dynamic Analysis, Static Analysis: - Identify the file type, Identify the hash and search on the internet for any reference, scan the virus with local antivirus, Scan with multiple AV, PEView.

Dynamic Analysis: - Process Monitor, Process Explorer, Regshot, REMnux, Wireshark. Basics of Assembly Language

Programming: - Linux (AT & T syntax), Registers, Program Memory, Programs ASLR, Base Structure & system calls, Assembly Language Exit program, Write call, Data Types, Basic Instructions.

Basics of Assembly Language Programming: - String (MOVSx Series), Unconditional Branching, Zombie Scan, Call programming & evaluating ESP EIP, Conditional Branching, Loop instruction, Functions, Windows assembly language, Comparing AT&T syntax with intel syntax, Structure of the Intel code, Programs, Procedures, macros, Jump, If condition.

Loop Program: - How to take user input, String to integer and integer to string conversion, CRLF, Basics of Reverse Engineering: -IDA Pro, Algorithm used by the sub routine (Steps), OllyDbg, Scanf program, Decrypted the code of that file with the help of ollydbg.

Hands-on:-To crack a password and run the application, Checked the executable file with hex editor and changed the password and then run the application, We checked the file in IDA Pro and selected the string, offset and copied it in OllyDbg and analyzed it, after making the changes we login into the application and run that application (the password we set is successful),To check/analyze the malware what it was doing, how it is running (with the help of strings.exe),In this we did the Malware analysis (practiced both static & dynamic procedure) -given same to practice at home. Introduction to Window Internals: - PE Format, Standard Structure of PE Format, PE Header, PE Sections. Portable Executable File Format, Queries & Revision, PE file with the Python Code, CTF, and Documentation

-> How to create a Report.

GID5356 Fundamentals of Game Programming

- ♣ CLO01: Students will be able to program for a games
- ♣ CLO02: Students can develop their own games
- ♣ CLO03: Students can perform their games in multiple platforms.

Introduction with SFML: Sprites, Textures, Shapes draw. Font, Audio, sprite animation, Scrolling BG. Key inputs, Mouse inputs.

iOS Game programming: Designing Games with Swift, creating first swift game, Sprites, Camera, Actions, Physics, Adding Controls, spawning enemies, coins, and power ups, never ending Game. Collision events, HUD, Parallax BG, Adding Menus and Sounds, Integrating Game Center, App Store Publication.

Android Game programming: Introduction to Android, Installation the Development tools, First Android program, Graphics, Basic shapes, Loading and Drawing Images, Looping Game, Multi touch user input, Accelerometer, Linear acceleration and proximity sensor, Gravity and Pressure sensors, Tricorder, Playing with the Audio system, Android Game Engine, Sprite, Actor Class, Frame Animation, Sprite Sheet, Multi-Animation Technique, Collision detection, Linear velocity, Scrolling the Background, Ball and Paddle Game.

GID5357 Introduction to Game Engine

- CLO01: Students will be able to develop 2D games on their own.
- CLO02: Students will be able to develop 2D games on their own.
- CLO03: Students will be able to do in-game modelling and animations.

Scratch MIT: Introduction to Scratch, Scripts motion, looks, sounds, Pen, Data, Events, Control, Sensing, Operators, Costumes, Sounds .Adding a Background, Adding the Solid Ground Creating the Hero, Creating the Game's Final Target, Destroying the Hero and Resetting the Game, Moving to Layouts and Winning the Game, Adding Parallax, Creating Enemies with Basic AI, Shooting and Spawning Other Objects, Adding Scores and Energies, Adding Sounds and Music, Creating and Adding New Levels, Creating the AI of the Final Boss, Saving and Loading Your Game, Creating an Interactive Main Menu with Buttons.

Construct 2: Setting up the Stage, Adding a Background, Adding the Solid Ground, Creating the Hero, Creating the Game's Final Target, Destroying the Hero and Resetting the Game, Moving to Layouts and Winning the Game, Adding Parallax, Creating Enemies with Basic AI, Shooting and Spawning Other Objects, Adding Scores and Energies, Adding Sounds and Music, Creating and Adding New Levels, Creating the AI of the Final Boss, Saving and Loading Your Game, Creating an Interactive Main Menu with Buttons.

GID5358 Graphics Programming

- CLO01: Students will be able to program computer graphics renderers
- CLO02: Students can develop OpenGL applications
- CLO03: Students can perform transformations on objects in graphics application

Basics: Game Engine Architecture, Advanced C++, Modern OpenGL, Setup Extension Wrapper, Creating a window, Hello Window, Hello Triangle, Shader, Texture, Transformation, Coordinate Systems, Camera.

Lighting: Colors, Basic Lighting, Materials, Lighting maps, Light Casters, Multiple Lights.

Model Loading: Assimp, Model, Mesh.
Advanced OpenGL: Depth Testing, Stencil Testing, Blending, Face Culling, Framebuffers, Cubemaps, Advanced Data, Advanced GLSL, Geometry Shader, Instancing, Anti-aliasing.
Advanced Lighting: Advanced Lighting, Gamma Correction, Shadows, Normal Mapping, Parallax Mapping, HDR, Bloom, Deferred Shading, SSAO.
PBR: Theory, Lighting, Diffuse irradiance, Specular IBL 2D Game: Breakout, Setting Up, Rendering Sprites, Levels, Collision, Particles, Post Processing, Powerups ,Audio, Render Text.
2D Game: Breakout, Setting Up, Rendering Sprites, Levels, Collision, Particles, Post Processing, Powerups, Audio, Render Text.

GID5352 Game Design

- CLO01: Generate innovative ideas, and go beyond the obvious and predefined.
- CLO02: Listen to, evaluate, and respond critically to the ideas of others.
- CLO03: Identify steps, develop and manage a successful professional workflow.

The Early Days, Onward to Atari and Arcade Gaming, the Roots of Multiplayer Gaming, Dawn of the Home Console, the Video Game Crash, the First Console War, the Rise of 3D Gaming, Modern Age of Gaming
Introduction to the primary concepts of gaming, and an exploration of how these basic concepts affect the way gamers interact with our games. What defines a "game" and the mechanics and rules behind different types of games? Through four linked assignments you'll learn ways to create and describe a game concept, and specifically what makes a compelling game. Conceptual underpinnings of games, and all assignments can be completed with a pencil and paper
Introduction to the interdisciplinary study of video games, examining their cultural, educational, and social functions in contemporary settings. By playing, analyzing, and reading and writing about video games. Video game theory and the completion of a contemporary commercial video game.
What are the main Digital Game Genres and how they work, Game Design Thinking (Empathize, Define, Ideate, Prototype and test), Understand the evolution of the video game consoles, Understand how the Game Industry Works, how to apply good game design to your games, different types of controllers, Create different game Arcs and Loops, Create a good Progression in Level Design, Edit simple audio tracks with audacity, Organize game ideas, Find free assets for your projects.

GID5359 Game Design – 2D & 3D

- CLO01: Generate innovative ideas, and go beyond the obvious and predefined.
- CLO02: Listen to, evaluate, and respond critically to the ideas of others.
- CLO03: Identify steps, develop and manage a successful professional workflow.

Level Constraints: How Long Should This Level Be? Are We Trying to Show off Any New Tech, Art, Audio, or Similar? How Much Time Do I Have to Design It? If someone is paying for This Game, What Are Their Requirements? What Platform is It On? Where Does This Level Fit Into the Level Progression? Who is the Audience? What is required by the Story, Theme, or Plot? What Are My Set-Pieces? What Metrics Am I Bound By? What Does the Game's Macro Design Require From This Level? Brainstorming and Structure, coming up with Ideas, Narrowing It Down to Areas, Bubble Diagram, Rough Maps, flesh out Each Bubble, Connect the Areas Together.

Path-finding for 2D Platformers, Inspiration for Your Next Game's Theme and Genre, Creating a Game Using Steering Behavior's, Minimalism in Game Design: Examples, Tips, and Ideas, Making AI Fun: When Good Enough is Good Enough, The Key Design Elements of Roguelikes, A Mini-Post on Post-Match Mini-Achievements, Let Them Play: Don't Lock Your Players Out of Playing, Non-Interactive In-Game Tutorials, Interactive In-Game Tutorials, Background In-Game Tutorials, No In- Game Tutorial, Continual Learning and Experimenting, Don't Scare the Player Away, What Makes Games Funny? A Look at Comedy and Humor in Video Games, How to Incorporate Satisfying Death Mechanics into Your Game, Money by Another Name, Find the Recipe, Guess and See What Sticks, Made-to-Order Customization, anything is Possible, What Are Incremental Games, and Why Are They Fun?

Modelling Social Problems as a "Game", In Search for the Governing Principle, Concerns About a Mathematical Theory of Human Behavior, Let's Play a Game, Card Game Tutorial (No Audio), John Nash Discovered the Governing Principle, Nash Equilibrium, Traffic Game in Reality, Location Game, Policies of Two Parties, Nash Equilibrium and the Prisoner's Dilemma, Coordination Game and Self-Fulfilling Prophecy, Market Competition, Why Do People Come to Play Nash Equilibrium? Stylized Facts and Nash Equilibrium, Make Yourself Unpredictable: Mixed Strategy Equilibrium, Sports Games and Game Theory, Nash Equilibrium Exists in All Games, Digression: The Card Game Revisited, Digression: How You Played the Card Game and Addressing the Concerns about Game Theory, "Payoffs" in a Game: What Exactly Are Those Numbers? What does it mean that a Player is Rational? Domination: Strategies That Are "Obviously Good or Bad" Common Knowledge of Rationality, Low Rationality: What Happens if Players Are Not Very Smart? Game Theory under Zero-Intelligence: Biological Evolution, Fig Wasps Play a Nash Equilibrium, Group Rationality and The Rationality of Individuals, why is Group Rationality Different from Rationality of Individuals? Group Rationality vs. Rationality of Individuals in Biological Evolution, Group Rationality vs. Rationality of Individuals in Social Thought, How to Enforce Socially Desirable Outcomes, Cooperation of gas Stations in Long-Term Relationship Part I: Need for Cooperation, Cooperation of Gas Stations in Long-Term Relationship Part II:

Mechanism of Cooperation, Reputation and Brand Name, Cooperation in Loosely Knit Organization.

Modeling Social Problems as a "Game", In Search for the Governing Principle, Concerns About a Mathematical Theory of Human Behavior, Let's Play a Game, Card Game Tutorial (No Audio), John Nash Discovered the Governing Principle, Nash Equilibrium, Traffic Game in Reality, Location Game, Policies of Two Parties, Nash Equilibrium and the Prisoner's Dilemma, Coordination Game and Self-Fulfilling Prophecy, Market Competition, Why Do People Come to Play Nash Equilibrium? Stylized Facts and Nash Equilibrium, Make Yourself Unpredictable: Mixed Strategy Equilibrium, Sports Games and Game Theory, Nash Equilibrium Exists in All Games, Digression: The Card Game Revisited, Digression: How You Played the Card Game and Addressing the Concerns about Game Theory, "Payoffs" in a Game: What Exactly Are Those Numbers? What does it mean that a Player is Rational? Domination: Strategies That Are "Obviously Good or Bad" Common Knowledge of Rationality, Low Rationality: What Happens if Players Are Not Very Smart? Game Theory under Zero-Intelligence: Biological Evolution, Fig Wasps Play a Nash Equilibrium, Group Rationality and The Rationality of Individuals, why is Group Rationality Different from Rationality of Individuals?

Group Rationality vs. Rationality of Individuals in Biological Evolution, Group Rationality vs. Rationality of Individuals in Social Thought, How to Enforce Socially Desirable Outcomes, Cooperation of gas Stations in Long-Term Relationship Part I: Need for Cooperation, Cooperation of Gas Stations in Long-Term Relationship Part II: Mechanism of Cooperation, Reputation and Brand Name, Cooperation in Loosely Knit Organization.

Generating ideas for games, the core of a game, Defining the core loop of a game, Mechanics, dynamics, and systems in game design, pitch your ideas, document your design, and prepare yourself to enter the game industry. Game design documents, and steps through successfully pitch your ideas. improving game design skills, and dives into the differences between making games in the game industry and building games as an indie, Brainstorming, Rules and Discovery, rules are communicated to players, Balance, Learning the Rules, Tell a Story, Story Purpose, Writer-Driven, Writer-Led, Player-Led, Roleplaying & Character Motivation, Explaining & Imagining, The Friend and the Enemy.

GID5360 Game Design – BG

- CLO01: Generate innovative ideas, and go beyond the obvious and predefined.
- CLO02: Listen to, evaluate, and respond critically to the ideas of others.
- CLO03: Identify steps, develop and manage a successful professional workflow.

Game Design, Iteration & Rapid Prototyping, Formal Elements of Games, Aesthetics, Mechanics and Dynamics, The Early Stages of the Design Process, Generate Ideas, Decision-Making and Flow Theory, Kinds of Fun, Kinds of

Players, Military Intelligence & Good Grief, Games and Art, Design Playable Prototype, Stories and Games, Nonlinear Storytelling, Tale Of Two Stones, Design Playable Prototype, Testing, Game Criticism & Analysis, Playtesting, Analyze Your Design.

Role of Game Designer, Formal Elements, formal, abstract design tools, Game Idea, Everyday Verb Game Design, Working With Formal Elements, Conceptualization, Game Design Vocabulary, Experience of Play, Core Mechanics, Seven deadly sins game design, Working with dramatic elements, Functionality, Completeness and Balance, Story and Games, Balance, Play and analyze Fluxx, Team Structures, Stages of Development, how to make a project plan, Narrative Game design, Team formation & Schedule document, One sentence pitch, Analog prototyping and playtesting, One pager description, Real-Time simulation, Game design pillars, Which Are Good, Game pitch presentation.

How the System Works, The Challenge, The Three Stages of Documentation. Ten Points for a Successful Design Document

Game Flow Summary – How does the player move through the game? Both through framing interface and the game itself, Look and Feel – What is the basic look and feel of the game? What is the visual style? Gameplay, Game Progression, Mission/challenge Structure, Puzzle Structure, Objectives – What are the objectives of the game? Play Flow – How does the game flow for the game player, Mechanics – What are the rules to the game, both implicit and explicit. This is the model of the universe that the game works under. Think of it as a simulation of a world, how do all the pieces interact? This actually can be a very large section, Physics – How does the physical universe work? Movement in the game, Objects – how to pick them up and move them, Actions, including whatever switches and buttons are used, interacting with objects, and what means of communication are used, Combat – If there is combat or even conflict, how is this specifically modeled? Economy – What is the economy of the game? How does it work? Screen Flow -- A graphical description of how each screen is related to every other and a description of the purpose of each screen, Game Options – What are the options and how do they affect game play and mechanics? Replaying and saving, treasure Chests and Easter Eggs, Story and Narrative – Includes back story, plot elements, game progression, and cut scenes. Cut scenes descriptions include the actors, the setting, and the storyboard or script, Game World, General look and feel of world, Areas, including the general description and physical characteristics as well as how it relates to the rest of the world (what levels use it, how it connects to other areas, Characters. Each character should include the back story, personality, appearance, animations, abilities, and relevance to the story and relationship to other characters, Levels. Each level should include a synopsis, the required introductory material (and how it is provided), the objectives, and the details of what happens in the level. Depending on the game, this may include the physical description of the map, the critical path

that the player needs to take, and what encounters are important or incidental, Training Level, Interface, Visual System. If you have a HUD, what is on it? What menus are you displaying? What is the camera model? Control System – How does the game player control the game? What are the specific commands? Audio, music, sound effects, Help System, Artificial Intelligence, Opponent and Enemy AI – The active opponent that plays against the game player and therefore requires strategic decision making, Non-combat and Friendly Characters, Support AI -- Player and Collision Detection, Pathfinding, Technical, Target Hardware, Development hardware and software, including Game Engine, Network requirements, Game Art – Key assets, how they are being developed. Intended style.

GID5361 Game Testing

- CLO01: Generate innovative ideas, and go beyond the obvious and predefined.
- CLO02: Listen to, evaluate, and respond critically to the ideas of others.
- CLO03: Identify steps, develop and manage a successful professional workflow.

Introduction to Game Testing, Two Rules of Game Testing, How to Put a Resume Together, How give Examples During Job Interview, Contacting Game Developers, Intro to testing Schultz, History/working conditions & demographics Levy, Game life cycle/bug categories, tools & documentation Levy, Defect typing, ways to categorize software bugs Schultz, Bug reporting, Bare bones bug hunting Levy, Bug reporting, Test trees Schultz, Intro to project, Bug reporting, Combinatorial testing Schultz, Intro to Mantis bug database, Bug reporting, Elite bug hunting Levy, Test flow diagrams Schultz, The test process- black box, white box testing Schultz, Moving up the game ladder Levy, Cleanroom testing, modeling player behavior Schultz, Quality standards Schultz, Future of game testing Levy, Steps to become a video game tester, Learn what a game tester does, and decide if a job testing games is right for you, Learn the basic skills and vocabulary of game testing, Complete your formal education or training (optional), Write your game testing resume and cover letter, Search for jobs and apply for the openings that fit your salary needs, location needs, and desired lifestyle.

1) Combinatorial Testing, 2) Clean Room Testing, 3) Functionality Testing, 4) Compatibility Testing,

5) Tree Testing, 6) Regression Testing, 7) Ad hoc Testing, 8) Load Testing, 9) Play Testing.

GID5362 AI/ML

- CLO01: Students will be able to develop a robust and extensible artificial intelligence system that syncs with characters' animations
- CLO02: Students will be able to design smart NPCs (non-player characters).

Introduction to Mathematics: Vectors and Matrices, Linear Algebra, Probability Theory and Statistics, Stochastic, Statistical Modelling, Markov Hessian

Introduction and Basic Concepts, Supervised Learning Setup. Linear Regression ,Weighted Least Squares. Logistic Regression. Netwon's Method Perceptron. Exponential Family. Generalized Linear Models, Gaussian Discriminant Analysis, Naive Bayes. Laplace Smoothing. Kernel Methods, S.V.M. Kernels.
Neutral Networks, Bias/ Variance. Regularization. Feature/ Model selection, Practical Advice for ML projects, K-means. Mixture of Gaussians. Expectation Maximization, GMM(EM). Factor Analysis, Principal Component Analysis. Independent Component Analysis, MDPs. Bellman Equations. Value iteration and policy iteration, LQR. LQG. Monte Carlo Tree Search, LQR. LQG. Monte Carlo Tree Search, -QLearning. Value function approximation, Policy Search. REINFORCE. POMDPs, Adversarial Machine Learning.
Reinforcement Learning: Belman, Markov Decision, Sensor Network, Google Dopamine, Bellman Advanced, Dynamic Programming, Value & Policy Iterations, Exploration vs Exploitation, Monte Carlo, Q Learning, Tensor Processing.
Deep Reinforcement: Deep RL, Deep Q Learning, Deuling DQN, Artificial Neural Network, Neuro- evolution, Meta-learning, Control Theory, Policy Gradient methods, Reinforce Policy Gradient, Artificial Curiosity, Actor Critic A3C, Proximal Policy Optimisation(PPO), Bayesian Actor Critic, Multi-Agent RL, Alphago.

GID5363 Unity Game Development

- CLO01: Development of 2D & 3D games.
- CLO02: Development of Special effects and Multiplayer games.

UI, Unity programming, Unity Editor, Tools, Components, Input, Unity Asset store, Particles, Trail, Line renderer.
2D Games, sprite, sprite animation, Platform game, Scroll view, 2D Collision, 2D Trigger, Rigidbody2D, Raycast, line renderer, Mario type game.
3D Games, Model import, character animation, First person, Third person, Terrain creation, 3D Collision, 3D Trigger, Rigidbody3D, RPG type game.
Post production, Lighting, Materials, Camera, Walkthrough, Particles, Occlusion culling, Memory management.
Networking (Photon and UNET), Creating server, create room, Join room.

GID5364 AR/VR

- CLO01: Development of Augmented Reality applications.
- CLO02: Development of Virtual Reality applications.

Introduction to Augmented Reality**:** Concept, AR Device functions and Property, Framework, Marker-based AR, Marker-less AR, various software for developing AR applications. Taxonomy, Features, Applications, Difference between AR, VR and MR, Advantages, Challenges.
Marker Based AR: Vuforia, integrating Vuforia with Unity 3D, image target,

uploading image target five-star image concept, adding android sdk, placing 3D model/virtual content over image target, building an apk for the developed application. Vuforia

Introduction EasyAR, MarkerLess AR (ARCore & ARKit): Motion Tracking, Environment understanding, Light estimation, Integration of ARKit in Xcode, ARFace Tracking Configuration, ARWorld Tracking Configuration.

Introduction to VR : Concept, History, What is VR (Principles of VR, Optics, Displays, Tracking), Platforms & Paradigms (VR platforms, 3-DOF vs 6-DOF, 6-DOF Tracking, Difference between mobile and desktop VR, VR Development platforms), Building first VR Camera, Implementing Head Rotation, Lighting (Four Unity Lights, Baking, Lighting Panel, Global Illumination).

VR Software Development and Interaction**:** Creating Scripts, UI Design, Changing scene using script, Physics & Audio (Unity physics, rays, adding audio in VR), Advance VR scripting (adding Waypoints) Stereo Vision, Gaze based interaction, Reticle, Point and Click, Point and Load, Developing basic interaction, Selecting, Grabbing Object's, Throwing etc

Implementing User Interface in VR, Developing Hybrid Application with combining AR and VR, 180-degree game's vs 360-degree game's, Difference between Inside out and Outside In tracking Locomotion development: Teleportation, Transportation, Perambulation

Introduction of WebVR: A-Frame, React VR

VR Design: What is design, VR app design walkthrough, design process and iteration, user testing, documentation (sketching)

Setting Scene: Establishing scale, building scene, scene setting, mood, lighting.

Movement Mechanics: Simulator sickness, mobile movement mechanics, special considerations when using movement mechanics

High Immersion VR: Desktop VR Benefits & Constraints (High Immersion VR, Modes of VR, Case studies, 6-DOF design mindset)

High-Immersion Engineering: Setting up SteamVR, using SteamVR SDK, input handling teleportation, dash and artificial walking, grabbing and throwing, menu systems and input axis, SteamVR level loading

Cross-Platform development: SDKs, setting up oculus SDK, using oculus SDK, cross platform architecture.

CSL3361 Digital & Social Media Marketing Building Blocks and Content Development & Marketing

- **CLO01:** Understanding of the key concepts and trends associated with Digital Marketing & Internet Technologies.
- **CLO02:** Hands-on familiarity with the leading tools and techniques used in the customer–facing aspects of Digital Marketing & Internet Technologies.

- **CLO03:** Conceptual and practical education in the best practices used by industry leaders to produce superior business results in the management of Digital Marketing & Internet Technologies.

Introduction: An Introduction to Digital Marketing, Types of Digital Marketing, Career opportunities in Digital Marketing, Selection of Website topic.

Domain Selection & Registration: What is domain name, how to register domain name, how to select domain name, Premium Domain names, what is web hosting? Types of web hosting: Linux & Windows OS, Web hosting packages, Web hosting hardware, Choosing a web hosting company

What is web space and how much do I need? Data Transfer & Bandwidth, Virtual Servers & Shared Hosting, Dedicated Hosting and Business Hosting, Reseller Accounts. cPanel, WHM panel, Money back guarantees, Free trials. Creating a backup of web site, directory or hosting account? Create & Remove an Addon Domain? Park a domain? Redirect a web site or web page to another web site or web page? Create & Remove a Subdomain? Web Hosting Selection & Registration. Demonstration of Keyword researching tools, Market Samurai, Traffic Travis, Other online tools. Introduction, Key terms and concepts, Web design, Web development, Step-by-step guide to building a website in Wordpress.

WP Installation and Dashboard: Posting, Editing Posts and Tags And Categories, Links, Pages and Comments. Themes and Adding Themes, Widgets, Editors and Adding Plugins, Tools and Users,

General and Writing, Use of Visual Composer & its elements : Reading and Discussion, Permalinks and Media, Use of Visual Composer & its elements, Use of Visual Composer & its elements Contd, Visual Composer & its elements, All in One SEO pack installation and configuration and usage.

Google Analytics plugin installation, WooCommerce, Default WooCommerce Pages, Products Adding Products, Categories & Images. Defining featured product, Woo Commerce Settings & Shop Page Layouts, Shop Page Shortcodes & WooCommerce Widgets, Checkout Process. Adding products using woocommerce plugin, Installation and usage of Slider Revolution plugin, Creating Slider using slider revolution plugin, Creating HOME Page, displaying section wise products on HOME page, Setting up widget area bar information etc. Creating legal pages for eCommerce website i.e. Privacy Policy, Terms & conditions, Disclaimer and Refund policy page, Content development guidelines for META Tags, Creating META Tags, Defining META Tags on various pages, Defining image META tags etc.Writing blogs for the website. Making blogs SEO friendly using online content analysing tools e.g. www.wordcounter.net, Tools of the trade & Social Book Marking, Directory submission Classified / B2B directories and Forum Postings Q&A, Image album postings etc. Various Online Tool for Content Marketing, how to setup user login using social media login details, Research & Selection of Affiliate Network Programs & products, what is Google Adsense and How to apply

for Adsense program to earn money from Pay Per Click model, Digital and Social media Marketing Review Class

CSL3362 Search Engine Marketing (SEO & PPC), Web Analytics and Email Marketing & Management

- **CLO01:** Understanding of the key concepts and trends associated with Digital Marketing & Internet Technologies.
- **CLO02:** Hands-on familiarity with the leading tools and techniques used in the customer–facing aspects of Digital Marketing & Internet Technologies.
- **CLO03:** Conceptual and practical education in the best practices used by industry leaders to produce superior business results in the management of Digital Marketing & Internet Technologies.

E-business is booming and so are the opportunities for graduates with an E-Business BBA to:

- start their own e-business
- consult existing e-businesses
- work at e-business giants ranging from Airbnb.com to Amazon.com

What Is Search Engine Optimisation? How Search Engines Work, Ranking Factors, Website Architecture, Search Engine Periodic Table, Search Engine Heat Map, Search Engine Periodic, Search Engine on Page SEO factors, Placement of keywords, Internet Business Promoter (IBP) SEO software installation, how to use IBP SEO Tool

How to make Search Engine Friendly Page:

Testing Pages for ON PAGE SEO factors using SEO analysis tools i.e. IBP SEO software.

Traffic Travis SEO Analysis, On-Page Factors, Originality & Fresh Content, Writing for Humans, SEO Analysis, Images Optimization, Title, Desc, H1 and On page factors, What are Off-Page Factors: Understanding Off Page SEO, Right and Wrong Ways to Link, What is an Authority Site?, Planning the Off Page SEO Process, Site Audit, Off Page SEO Planning & Implementation, sitemaps & URL How to do competitors analysis. Factors for analysing competitors' websites

Search Engine Marketing (SEM)/ Pay Per Click Advertising (PPC): Introduction, What Is Pay- per-Click? Key terms and concepts, Advertising in search, Types of Google Ads campaigns. Understanding various types of Google Ads campaigns, the elements of a search ad, targeting options, Bidding and ranking for search ads, Tracking, Use the Google Ads Editor to Manage Your Ads and Keywords.

Search Engine Marketing (SEM)/ Pay Per Click Advertising (PPC)..: Planning and setting up your Ist search advertising campaign, The Benefits of PPC in the Purchase Phase, Set Up the Search and Content Networks, Keyword Research,

Trademarks and Keywords, Search Engine Marketing (SEM)/ Pay Per Click Advertising (PPC) Contd, Negative Keywords, How Many Keywords can you have?, Creating the Ad Groups, Naming the Ad Groups, Writing the Ads, Competitors' Bids, The Quality Score, The Ad Rank Score, Manual Bid Management, Automated Bid Management, What Is the Best Position for Your Ads?, Creating reports for Google Ads using Report section

Creating reports for Google Ads using Report section

Web Analytics (Google Analytics): Introduction, Basic Analytics and Why Analytics?, Setting Up Google Analytics, What Do We Do With Them?, Analytics and AWStats, AWStats Dashboard, Summary, Days and Hours, Countries, Visits Duration, Pages-URL, Operating Systems and Browsers, Key Words and Key Phrases., Analytics Settings, Website Profiles, Adding a Profile, Checking Status, Editing a Profile, Deleting a Profile, Access Management, Adding a User, Setting User, Permissions, Deleting a User, Filtering Your Data, Understanding Goal Setting.

The Reporting Dashboards, Who Should Use This View, Absolute Unique Visitors, Visitor Loyalty, Keyword Specific Testing etc.

Email Marketing: Introduction to Email Marketing, Key terms and concepts, Email Software and Tools, Step-by-step process, Tools of the trade (Mailchimp, Groupmail and Interspire Email Marketer etc.), MailChimp Camapign Setup, Email List Building, Double Opt-in email list building and strategy making, Email Marketing Contd..: E-mail campaign planning, Objective setting, E-mail campaign budgeting, Campaign design: targeting, offer, timing, creative, Campaign integration, Measurement & Testing, GroupMail email marketing software installation, configuration, SMTP configuration and setting up mail campaign, INTERSPIRE email marketing software installation, configuration, SMTP configuration and setting up mail campaign, Web Forms Lead Importing, Integrating Landing Page Forms, Campaign Reports and Insights, Segmentation Strategy, Segmentation Lists, Auto-Responder Series, Triggering Auto –Responder Emails, Auto Responder follow up sequence setup.

CSL3363 Social Media Marketing & Optimization and Digital Marketing Strategy & Lead Generation

- **CLO01:** Understanding of the key concepts and trends associated with Digital Marketing & Internet Technologies.
- **CLO02:** Hands-on familiarity with the leading tools and techniques used in the customer–facing aspects of Digital Marketing & Internet Technologies.
- **CLO03**: Conceptual and practical education in the best practices used by industry leaders to produce superior business results in the management of Digital Marketing & Internet Technologies.

Social Media Marketing (SMM): Introduction, Key terms and concepts, Social

media channels & Social networks. Content creation, Location and social media, Rules of engagement. What is Facebook Marketing, Overview & Why Facebook? Get to know the admin panel, Creating Business Page, Tools of the trade, Advantages and challenges. How to connect with people by planning your Facebook page and understanding how it is structured to make the maximum use of it. Facebook Marketing Strategies for Fan Page, Introduction to Fan Page Marketing Strategies, All Connections, Invite Potential Followers, Distributer Pages for Your Content, Competitions: Rules & Steps Facebook Inner Marketing Strategies structure, Psychology of Successful Posts, Time for Hooked Headlines, How to Create Network Effect, Notification Challenge. Facebook Group Marketing Strategies, Introduction to Facebook Groups, Start Your Group, Fundamental Group Marketing Setup, Group Monetization, Group Up. Live Streaming Professional, Introduction to Live Streaming, How To Go Live, Live Stream Planning, Live Stream Monetization, Tips to Master Live Acting, Live Stream Mission. Facebook Ads & Promotions: Introduction to Facebook Ads Manager, Set Your Billing, Define Saved Audience, Create Ads: Reach, Create Ads: Engagement Posts, Define your Targeted Customers. Facebook Ads & Promotions, Facebook Retargeting, Introduction to Retargeting, Create Pixel, Pixel Inestallation, Pixel Status & Checker, Pixel Custom Audience. Lookalike & Custom Audience, Conversion Ad & Custom Conversion, Start Retargeting. Event Marketing, Introduction to Events, Event Setup, Marketing your Event Facebook Shop setup, Introduction to facebook Shop, Shop and product setup, Payment option setup etc. How to analyse Facebook reporting and insight

LinkedIn Marketing: Introduction – Page Setup and Paid Advertising and Reporting, LinkedIn Marketing

Twitter Marketing: Introduction, Page Setup and Paid Advertising, Twitter Marketing

Instagarm Marketing – Introduction – Page Setup and Strategy making, Paid Advertising & Reporting Pinterest Marketing – Introduction – Page Setup and Strategy making, Paid Advertising & Reporting

Mobile Marketing: Mobile marketing terminology, concepts and techniques, designing a mobile strategy, plans and, Mobile sites, apps, games marketing, advertising, messaging and video, Mobile strategy monitoring, evaluation and corrective actions

CSL3364 Affiliate Marketing and Online Reputation Management (ORM)

- **CLO01:** Understanding of the key concepts and trends associated with Digital Marketing & Internet Technologies.
- **CLO02:** Hands-on familiarity with the leading tools and techniques used in the customer–facing aspects of Digital Marketing & Internet Technologies.

- **CLO03:** Conceptual and practical education in the best practices used by industry leaders to produce superior business results in the management of Digital Marketing & Internet Technologies.

Introduction to Affiliate Marketing: Overview of Affiliate Marketing, Basics of Affiliate Marketing and Its Role in Internet Marketing, Preparing to Begin Affiliate Marketing, Affiliate Marketing and the Major Players, Types of Affiliate Sites That Work Best for Monetization, Integrating Affiliate Marketing Into Your Marketing Mix, Traditional Affiliate Networks vs. CPA Networks, Finding a Niche and Doing Your Research, Gearing Up for Your Marketing Push, Content: What Works and How to Create It, Selecting the Right Networks to Work With. Adding Paid Sponsoring Placement, AdSense and Links, Determining Costs and Creating a Business Plan, Tracking Tools, Obtaining and Placing Tracking Code, Are You Delivering the Content Your Audience Wants?, Using Video, Blogs, Email and Social Media to Broadcast, Methods for Delivering a Variety of Content, Applying to Programs and How to Get Approved, Building Better Landing Pages, Selling Affiliate Marketing as a Viable Channel to Executives

Understanding Search: SEO/SEM and Their Role in Affiliate Marketing, Creating Content for Your Affiliate Marketing Site, Getting the Most From What You Are Delivering, Measuring the Effectiveness of Your Campaigns, Driving Traffic Using Natural and Paid Search, Negotiating a Better Deal or Higher Commissions, Leveraging Your Affiliate Channel Into Other Areas of Your Business, Tools for Optimizing Your Site, Network Reporting, Forums, Websites, Conferences and Message Boards, Leveraging Social Media, Engaging Your Audience, Dealing With a Network Representative or Affiliate Manager, Generating Revenue Through a Membership Site or List Building, Blending Online and Offline Campaigns, Tools for Monitoring What People Are Saying About Your Brand and Website, How to Promote Your Efforts, Legal Best Practices and Ethical Considerations, Use of Collected Data and Respecting Privacy Concerns, Trademark Bidding, Understanding Affiliate Marketing Terms of Service Agreements

Search Engine Techniques: Black Hat vs. White Hat, Collecting Data and Ensuring Privacy, Website Protection, Assessing Potential Risks and Challenges, How Super-Affiliates Choose Programs to Promote, Building Trust, Influence and Engagement With Customers, Coupons and Deals, Methods to Make the Networks Work Harder for You, Successful Affiliate Marketing, Affiliate Marketing Through Email Marketing, Online Publisher Perspective, ShareASale Affiliate Network & Coupons and Deals

Online Reputation Management: Understanding ORM scenario, how to deal with criticism online, understanding tools for monitoring online reputation, Step by Step guide to overcome negative online reputation

CSL3308 Software Quality and Assurance Testing

- **CLO01:** They will understand the Software Testing process.
- **CLO02:** They will understand the concept of Software Quality Assurance.
- **CLO03:** They will get the knowledge of Unit and Integration Testing and find out the difference between them.
- **CLO04:** Understand different Software testing techniques and try to implement.
- **CLO05:** Understand different testing tool available in the market for different types of analysis.

Introduction: Software Quality, Role of testing, verification and validation, objectives and issues of testing, Testing activities and levels, Sources of Information for Test Case Selection.

Unit Testing: Concept of Unit Testing, Static Unit Testing, Defect Prevention, 3.4 Dynamic Unit Testing, Mutation Testing, Debugging, Unit Testing in extreme Programming.

Control Flow Testing: Outline of Control Flow Testing, Control Flow Graph, Paths in a Control Flow Graph, Path Selection Criteria, All-Path Coverage Criterion, Data Flow Testing- Data Flow Anomaly, Overview of Dynamic Data Flow Testing, Data Flow Graph, Data Flow Terms, Data Flow Testing Criteria.

System Integration Testing: Concept of Integration Testing, Different Types of Interfaces and Interface Errors, System Integration Techniques, Software and Hardware Integration, Test Plan for System Integration, System Test categories-Basic Tests, Functionality Tests, Robustness Tests, Interoperability Tests, Performance Tests, Scalability Tests, Stress Tests, Load and Stability Tests, Reliability Tests, Regression Tests, Documentation Tests. Functional Testing-Equivalence Class Partitioning, Boundary Value Analysis, Decision Tables, Random Testing, Error Guessing, Category Partition, System Test Design: Test Design Factors, Requirement Identification, Characteristics of Testable Requirements, Test Design Preparedness Metrics, Test Case Design Effectiveness.

System Test Planning And Automation: Structure of a System Test Plan, Scheduling and Test Milestones, System Test Automation, Evaluation and Selection of Test Automation Tools, System Test Execution: Preparedness to Start System Testing, Metrics for Tracking System Test, Metrics for Monitoring Test Execution, Measuring Test Effectiveness, Acceptance Testing-Types of Acceptance Testing, Acceptance Criteria, Selection of Acceptance Criteria, Acceptance Test Report, Acceptance Testing in extreme Programming.

Software Quality: Five Views of Software Quality Quality Factors and Criteria, Relationship between Quality Factors and Criteria, Quality Metrics, ISO 9126 Quality Characteristics, ISO 9000:2000 Software Quality Standard

CSP1308 Software Quality Assurance & Testing Lab

Practical Implementation of Theoretical Concepts.

CSL3310 Business Intelligence and Data Warehousing

- **CLO01:** They will understand the business intelligence process.
- **CLO02:** They will understand the concept of data preprocessing.
- **CLO03:** They will get the knowledge of OLAP and OLTP and find out the difference between them.
- **CLO04:** Understand different data mining techniques and try to implement.
- **CLO05:** Understand different data mining tool available in the market for different types of analysis.

Introduction: Types of digital data, structured, semi structured and unstructured data, terminologies- data, knowledge, information, intelligence, data warehouse definition, goals and need of data warehouse, evolution of data warehouse.

Data Mining: Motivation, importance, knowledge discovery process, data mining vs. query tools, what kind of data can be mined?

Data Pre-processing: Why preprocess the data, major tasks, ETL and data cleaning, missing values, noisy data, data cleaning as process, data integration, data reduction, clustering data discretization and concept hierarchy generation.

OLAP and OLTP: OLAP vs. OLTP technologies, operations of OLAP, data model for OLTP and OLAP, OLAP architectures-MOLAP, ROLAP, HOLAP, role of OLAP tools in the BI architecture.

Principles of Data Warehousing (architecture and design techniques): Three-tier architecture for a warehouse, metadata, data warehouse models, concepts of data integration, data warehouse approaches, Ralph Kimball's, Inmon's approach.

Needs and Advantages of using Data Integration: Introduction to common data integration approaches.

Multidimensional Data Model: Data cubes, schemas for multidimensional database, Stars, snowflakes and fact constellations.

Mining Frequent Patterns: Association and correlations, basic concepts and methods, Apriori algorithm, classification and prediction, decision tree induction, Bayes classification methods, rule- based classification.

Clustering Techniques: K-mean square, text and web mining, enterprise content management. **Getting started with BI:** Meaning and definition of business intelligence, business analytics and concepts and use in business intelligence.

BI Technology: BI technology, BI roles & responsibilities, framework of BI, role of data warehousing in BI, BI infrastructure components, BI process, text and web mining, enterprise content management.

Measures & Metrics: KPIs and performance management, reporting tools, scorecards reporting tools, dashboards.

CSP1310 Business Intelligence and Data Warehousing Lab

- **CLO01:** They will understand the business intelligence process.

- **CLO02:** They will get the knowledge of OLAP and OLTP and find out the difference between them.
- **CLO03:** Understand different data mining techniques and try to implement.
- **CLO04:** Understand different data mining tool available in the market for different types of analysis.

Introduction to Pentaho, Implementation of Star and Snow Flake schema on Data Warehouse, Preparation of Data Set, Perform Multidimensional Modeling in MS Excel, Illustrate Data Analysis using Pivot Table and Charts, Perform What-if Analysis, Perform Data Visualization, Perform Slicing and Dicing operations in MS Excel. Creating a Repository using Kettle, Connect to Repository and creating ODBC Connection, Create a Simple PDI Transformation for transforming data From Database table to Flat File, From Database table to Excel file, From Excel file to Database table, From Text file to Database table, Use of Filter rows for dividing Source data to two destinations, Use of dummy output field to integrate multiple distinct sources to single destination, Implement Lookup using Lookup transformation.

CSL3304 Artificial Intelligence and Expert System

- **CLO1:** Learning the basic concepts of Artificial Intelligence.
- **CLO2:** Represent Knowledge using propositional calculus and predicate calculus.
- **CLO3:** Use inference rules to produce predicate calculus expression.
- **CLO4:** Demonstrate awareness of informed search and uninformed search techniques.
- **CLO5:** Explain about AI techniques for planning, knowledge representation and management.
- **CLO6:** Outline the process involved in Expert systems and in building such systems

Overview of Artificial Intelligence: Definition & Importance of Artificial Intelligence

Knowledge: General Concepts about Introduction, Definition and Importance of Knowledge Knowledge-Based Systems, Representation of Knowledge, Knowledge Organization, Knowledge Manipulation, Acquisition of Knowledge.

Logic: First order logic, representation revisited, Syntax and semantics for first order logic, Using first order logic, Knowledge engineering in first order logic. Inference in First order logic, Prepositional versus first order logic, unification and lifting, forward chaining, backward chaining, Resolution.

Knowledge Representation: Introduction, Syntax and Semantics for Prepositional logic, Syntax and Semantics for FOPL. Properties of Wffs, Conversion to Clausal Form, Inference Rules, Inference Methods, Representations Using Rules.

Knowledge Representation Techniques: Structured Knowledge, Graphs, Frames and Related Structures-Introduction, Associative Networks, Frame Structures, Conceptual Dependencies, Scripts. **Expert Systems:** Definitions types, components, Expert System Development Process, Searching, Learning and

Planning Searching: State-space representations, Depth-first, breadth-first, heuristic search, Planning and game playing, Genetic algorithms Learning, Planning and Explanation in Expert System: Neural Expert System, Fuzzy, Expert System, Real Time Expert Systems Case Studies: Implementation Tools- Prolog, Study of existing, expert systems- TIERES, MYCIN, Probabilistic Reasoning, Probabilistic inference networks, Fuzzy inference rules, Bayesian rules, Neural networks, Principles, biological analogies, Training (techniques and errors), Recognition.

CSL4208 Computer System Architecture

- **CLO01:** Write instructions in generic assembly language and understand the interdependencies among assembly languages, computer organization, and design.
- **CLO02:** Develop microcode of typical set of instructions.
- **CLO03:** Develop a simple Register Transfer Language (RTL) and use it to specify various computer operations.
- **CLO04:** Specify sequence of micro operations and control decisions required for their operation.
- **CLO05:** Translate symbolic code to an equivalent binary program.
- **CLO06:** Recognize the concept of Instruction format, execution of different instruction and addressing modes.

Introduction to Computer Organization & Architecture: Evolution of Computers from 1st Generation to Pentium and Power PC, Von Neumann machine Flynn's Classification – SISD, SIMD, MISD, MIMD.

Basic Computer Organization: Computer Registers, Instruction Codes, Computer Instructions, Timing and Control, Instruction Cycle, Memory Reference Instructions Input-Output and Interrupt, Complete Computer Description. Basic Computer Organization taking 8085 as an example binary arithmetic - add, subtract, multiply - algorithms and implementations.

Micro programmed Control: Control Memory, Address Sequencing, Micro program Example, Design of Control unit.

Central Processing Unit: General Register Organization, Stack Organization. Instruction Format (Three address, Two Address, one address, zero address), Addressing Modes, Data Transfer and Manipulation, Program control, RISC/CISC Characteristics, Pipelining and Instruction cycle.

Input-Output Organization: Peripheral Devices, I/O Interface Asynchronous Data Transfer, Modes of Transfer Direct Memory Access (DMA), DMA Transfer, DMA Controller Input-Output Processor (IOP), CPU-IOP Communication.

Memory Organization: Memory Hierarchy Main Memory (RAM & ROM Chips), Auxiliary Memory (Magnetic Disc & Tapes) Associative Memory Cache Memory (Associative Mapping, Direct Mapping, Set-Associative Mapping), Virtual Memory

CSL4305 Theory of Computation

Mathematical Notations and Techniques: Mathematical Foundation of Theory of Computation Basic Mathematical Objects – Sets, Logic, Functions, Relations, Languages

Non-determinism and Kleene's Theorem Regular and Nonregular Languages, Regular Languages and Finite Automata, Regular Expressions and Finite Automata, Context Free Languages and Pushdown Automata, Non-Context-Free Languages.

Introduction to Turing Machines: Unsolvable Problems, Restricted Turing Machines, Programming Techniques for Turing Machines, Undecidability, Post's Correspondence Problem, Undecidable Problems about Turing Machines Intractable Problems, Classes of Problems, NP Complete Problems, Problems Solvable in Polynomial Space, Language Classes Based on Randomization, The Complexity of Primality Testing, A Problem That Is Complete for PS, Complements of Languages in NP, A Restricted Satisfiability Problem.

CSL5407 Compiler Design

- To understand the context and use of a compiler
- To understand the implementation of lexical analysis, parsing of the code and semantic analysis of the source code
- To understand the implementation of back end include intermediate code generation, run time environment, code generation and register allocation
- To understand the special aspects of compilers and runtime such as code optimization, garbage collection etc.

Introduction to Compiler: Analysis of the source program, various phases of compiler.

Compiler structure: Analysis-Synthesis model of compilation, Compiler construction tools.

Lexical analysis: Role of Lexical Analyzer, Input Buffering, Specification of tokens, Recognition of Tokens, LEX, Finite Automata. Syntax Analysis- Role of Parser, Context Free Grammar, Writing a Grammar, Top Down parsing- Recursive Descent, Predictive Parser, Construction of table of Predictive Parser.

Bottom Up Parsing: Shift Reduce Parser, Operator Precedence Parser, construction of table of Operator Precedence, LR Parsers, construction of table of LR Parser, construction of table of SLR Parser, construction of table of Canonical LR Parsing Table, construction of table of LALR Parser.

Parser Generator: YACC Syntax directed Translation- Forms of syntax directed definition, Synthesis attributes, Inherited attributes, Dependency graphs, Evaluation order, Construction of Syntax Tree. Run time Environment-Source Language Issues, storage organization, Storage Allocation Strategies, Access to non-local names, parameter passing, Symbol table.

Intermediate code generation: Intermediate Languages, Declarations Assignment

statements, Names in Symbol Table, Reusing Temporary Names, Addressing Array Elements. Boolean expressions and procedure calls. Code generation: Issues in design of code generator, Target machine, Basic blocks and flow graphs Simple code generators, DAG representation of basic blocks, Peep hole optimization, Code generation from DAGs Code generator.

Code optimization: Introduction, Principle sources of optimization, Optimization of basic blocks, Loops in flow graph, Introduction to Global flow data analysis, Code improving transformations, dealing with aliases.

CSL5411 Network Security

- **CLO01:** Identify common network security vulnerabilities/attacks
- **CLO02:** Explain the foundations of Cryptography and network security
- **CLO03:** Critically evaluate the risks and threats to networked computers.
- **CLO04:** Demonstrate detailed knowledge of the role of encryption to protect data.
- **CLO05:** Identify the appropriate procedures required to secure networks.

Introduction to Network Security: Security Attacks – Motives, common Attacks, Vulnerabilities, Defense Strategies and Techniques, Access Control – Authentication and Authorization, Data protection, Prevention and Detection, Response, Recovery and Forensics.

Overview to Computer Networking: LAN, Network Layer protocols - IP, Transport Layer protocols – TCP, UDP.

Basics of Cryptography: Classical Encryption Techniques – Symmetric and Asymmetric cryptography, SubstitutionTechniques – Monoalphabetic ciphers, Polyalphabetic ciphers, Transposition Techniques, Block Ciphers and Stream Ciphers, Symmetric Cryptography, Block Ciphers and Types of attacks ,Data Encryption Standard and Triple DES, AES, Overview of Block Cipher Modes of Operation , Stream Ciphers and RC4, Public-Key Cryptography and RSA, Principles of Public-Key Cryptosystems – The RSA Algorithm, Security of RSA, Diffie-Hellman Key Exchange, Other Public-Key Cryptosystems, Cryptographic Hash, Secure Hash Function, Properties of Hash Function, MAC, Hash and MAC, Algorithms -- Secure Hash Algorithm, HMAC, MD5, Attacks, Digital Signatures.

Web Security: Secure, Socket Layer and Transport Layer Security, Electronic Commerce Security: Electronic Payment System, Secure electronic transaction (SET), Cyber Cash, Ecash (Digicash), Malicious Software-Types of Malicious software, Viruses, Worms, Distributed Denial of Service Attacks.

Firewalls: The need of Firewall, Firewall characteristics, Types of firewalls, intrusion prevention

Appendix-B: Calculation of CGPA

The CGPA (calculated on a 10-point scale) would be used to describe the overall performance of a student (from the semester of admission till the point of reckoning) in all courses for which LETTER GRADES will be awarded. GPA will indicate the performance of student for any particular semester. Formulas for calculation of GPA and CGPA have been provided as below:

$$GPA_i = \frac{\sum_{j=1}^{n} C_{ij} G_j}{\sum_{j=1}^{n} C_i}$$

$$CGPA = \frac{\sum_{i=1}^{N} \sum_{j=1}^{n} GPA_i * C_{ij}}{\sum_{i=1}^{N} \sum_{j=1}^{n} C_{ij}}$$

Where n = number of courses in the semester; N = number of semesters; GPA_i = GPA for the ith semester; C_{ij} = number of credits for the jth course in ith semester; and G_j = Grade point corresponding to the grade obtained in the jth course.

Table below shows the grade point for every valid grade, that may be awarded to a student pursuing a particular course:

% Marks Range of total	Grade	Grade Point	Qualitative Meaning
80-100	O	10	Outstanding
70-79	A+	9	Excellent
60-69	A	8	Very Good
55-59	B+	7	Good
50-54	B	6	Above Average
45-49	C	5	Average
40-44	P	4	Pass
0-39	F	0	Fail
	I	0	Absent

I grade would be awarded to those students, who due to some reason or the other

have not been able to appear in certain required number of evaluation components conducted for a course. Later I grade would be changed to a relevant grade, once a student has fulfilled the requirement of appearing in certain number of evaluation components for a course.

Example to Understand the Calculation of GPA

Suppose a student is registered in four courses 'W', 'X', 'Y' and 'Z' in a particular semester as mentioned below in the Column - I of the table. Column - II in the table below depicts the number of credits, which those courses carried. At the end of the semester, student was awarded with the grades as mentioned in Column – III in the table given below. Column – IV indicates the corresponding grade weight. Column – V and Column – VI indicate essentially the Credit value and Grade Points for every course completed by a student in that particular semester.

Courses in which student registered (Column – I)	**Credits (Column – II)**	**Letter Grade (Column – III)**	**Grade Value (Column – IV)**	**Credit Value (Column – V)**	**Grade Points (Column – VI)**
Course W	3	B-	6	3 x 6	18
Course X	3	A-	8	3 x 8	24
Course Y	3	A+	10	3 x 10	30
Course Z	2	A+	10	2 x 10	20
Total	**11**			**Total**	**92**

Thus, the total GPA of the student would be =

$$GPA = \frac{\textit{Total grade pts.}}{\textit{Total no.of credits}} = \frac{92}{11} = 8.36$$

Suppose the GPA of the student in two successive semesters is 7.0 and 8.0 with respective course credits being 12 and 11, then the

$$CGPA = \frac{7 \times 12 + 8 \times 11}{12 + 11} = \frac{84 + 88}{23} = 7.48$$