J.N.N INSTITUTE OF ENGINEERING

AUTONOMOUS

NAAC 'A' Grade | Approved by AICTE | Affiliated to Anna University

ACADEMIC CURRICULUM
(REGULATION 2022)

FOR
UNDER GRADUATE
PROGRAMMESCHOICE BASED
CREDIT SYSTEM
(Applicable to the students admitted from the Academic Year 2022 – 2023 onwards)

B.E. COMPUTER SCIENCE AND ENGINEERING (CYBER SECURITY)

B.E. COMPUTER SCIENCE AND ENGINEERING
(CYBER SECURITY)

ABOUT THE DEPARTMENT

Cyber security is the practice of defending computers, servers, mobile devices, electronic systems, networks, and data from malicious attacks. It's also known as information technology security or electronic information security.

B.E Cyber Security program will enable you to be ready for Industry 4.0 emerging and exponential technologies. This course is industry-integrated with EC-Council certifications in Cyber Security including the world-famous Certified Ethical Hacker (CEH), Certified Network Defender (CND), Certified Security Analyst (ECSA), Computer Hacking Forensics Investigator (CHFI), among others. The program will be delivered using project- based learning leading to internships and career opportunities with start-ups and MNC's in India.

The B.E program in CSE (Cyber Security) is intended to mould students into well prepared Cyber Security professionals and has been designed with a good balance between theoretical & practical aspects, analytical and architectural methods complemented by academic research and industry best practices.

VISION

To produce globally competent, quality computer professionals and to groom thestudents as notch professionals

MISSION

1. Establish closer and symbolic relationship with IT industries and expose the students to the cutting edge technological advancements
2. Provide impetus and importance to beyond curriculum learning and thereby provide an opportunity for the student community to keep them updated with latest and socially relevant technology
3. To encourage participation of stakeholders in Research and Development.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

Bachelor of Computer Science and Engineering (Cyber Security) curriculumis designed to prepare the graduates having attitude and knowledge to

1. Apply their technical competence in computer science to solve real world problems,with technical and people leadership.
2. Conduct cutting edge research and develop solutions on problems of socialrelevance.
3. Work in a business environment, exhibiting team skills, work ethics, adaptability andlifelong learning.

PROGRAM OUTCOMES POs:

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using firstprinciples of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledgeto assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilitiesand norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a memberor leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities withthe engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OBJECTIVES (PSOs)

1. Exhibit design and programming skills to build and automate business solutionsusing cutting edge technologies.
2. Strong theoretical foundation leading to excellence and excitement towards research,to provide elegant solutions to complex problems.

CHOICE BASED CERDIT SYSTEM
B.E. COMPUTER SCIENCE AND ENIGNEERING (CYBER SECURITY)
CURRICULUM FOR SEMESTERS I TO VIII AND
SYLLABI FOR SEMESTERS I AND II
SEMESTER I

S.No	COURSE CODE	COURSE TITLE	MODE	PERIODS PER WEEK				TCP	C	CAT
				L	T	P	J			
MANDATORY COURSE										
*	22IP100	Induction Programme	-	-	-	-	-	03 Weeks	0	-
THEORY COURSES										
1	22HST101	Professional English	L+P	2	0	4	0	6	4	HSMC
2	22BST101	Basic Mathematics for Engineers	L+T	3	2	0	0	5	4	BSC
3	22BST102	Engineering Physics	L	3	0	0	0	3	3	BSC
4	22BST103	Engineering Chemistry	L	3	0	0	0	3	3	BSC
5	**22EST101 / ICC1**	**Problem Solving and Python Programming / ICC1***	L	3	0	0	0	3	3	ESC
6	22HSM101	Heritage of Tamils	L	1	0	0	0	1	1	HSMC
EMPLOYABILITY ENHANCEMENT COURSE										
6	22EET101	Engineering and Professional Skills	L+P	1	0	2	0	3	2	EEC
PRACTICAL COURSES										
7	22ESP101	Problem Solving and Python Programming Laboratory	P	0	0	4	0	4	2	ESC
8	22BSP101	Physics and Chemistry Laboratory	P	0	0	4	0	4	2	BSC
EMPLOYABILITY ENHANCEMENT COURSE										
9	22EEP101	Product Tinkering Laboratory	P	0	0	2	0	2	1	EEC
			TOTAL	**17**	**02**	**16**	**00**	**34**	**25**	

L-Theory, T-Tutorial, P-Practical, J-Project TCP-Total Credit PeriodC-Credit CAT- Category
*** Industry Core Courses**

SEMESTER II

S.No	COURSE CODE	COURSE TITLE	MODE	PERIODS PER WEEK				TCP	C	CAT
				L	T	P	J			
THEORY COURSES										
1		Language Elective	T+P	3	0	2	0	5	4	HSMC
2	22BST201	Statistics and Transforms	T	3	2	0	0	5	4	BSC
3	**22CYT201 / ICC2**	**System Software / ICC2****	L	3	0	0	0	3	3	PCC
4	22CST201	Object Oriented Programming	L+P	2	0	2	0	4	3	PCC
5	22EST205	Basic Electrical and Electronics Engineering	T	3	0	0	0	3	3	ESC
6	22EST202	Engineering Graphics	T+P	1	0	4	0	5	3	ESC
7	22HSM201	Tamils and Technology	L	1	0	0	0	1	1	HSMC
EMPLOYABILITY ENHANCEMENT COURSE										
8	22EET201	Innovation and Design Thinking*	T	2	0	0	0	2	2	EEC
MANDATORY COURSE										
9		NCC/NSS/YRC Credit Course Level- I	-	**1**	**0**	**0**	**0**	**1**	**1#**	-
PRACTICAL COURSES										
10	22ESP201	Engineering Product Laboratory	P	0	0	3	0	3	1.5	ESC
11	22ESP203	Basic Electrical and Electronics Engineering Laboratory	P	0	0	3	0	3	1.5	ESC
TOTAL				**18**	**02**	**14**	**00**	**34**	**26**	

L- Lecture T- Tutorial P- Practical J- Project TCP- Total Contact Period
C- Credits CAT- Category

 # NCC Credit Course level 1 is offered for NCC students only. The grades earned by the studentswill be recorded in the Mark Sheet, however the same shall not be considered for the computationof CGPA.

***Common for all branches**

** **Industry Core Courses**

SEMESTER III

S.No	COURSE CODE	COURSE TITLE	MODE	PERIODS PER WEEK				TCP	C	CAT
				L	T	P	J			
HEORY COURSES										
1	22CYT301	Introduction To Cyber Security	L	3	0	0	0	3	3	PCC
2	**22CST302**	**Programming in Java / ICC3*** **	L+P	3	0	2	0	5	4	PCC
3	22CYT302	Database Management Systems and Security	L	3	0	0	0	3	3	PCC
4	22CYT303	Data Structures	L	3	0	0	0	3	3	PCC
5	22HST301	Entrepreneurship and startups*	L	3	0	0	0	3	2	HSMC
PRACTICAL COURSES										
6	22CYP301	Database Management Systems and Security Laboratory	P	0	0	4	0	4	2	PCC
7	22CYP302	Data Structures Laboratory	P	0	0	4	0	4	2	PCC
EMPLOYABILITY ENHANCEMENT COURSE										
8	22EEP301	Soft Skills*	P	0	0	2	0	2	1	EEC
			TOTAL	**15**	**0**	**12**	**00**	**27**	**20**	

***Common to all Branches**

**** Common to all Branches, selection from one minor vertical/approved honors subjects**

*****Industry Core Courses**

L-Theory, T-Tutorial, P-Practical, J-Project TCP-Total Credit Period
C-Credit CAT- CATEGORY

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SEMESTER IV

S.No	COURSE CODE	COURSE TITLE	MODE	PERIODS PERWEEK				TCP	C	CAT
				L	T	P	J			
THEORY COURSES										
1	22BST401	Discrete Mathematics	L+T	3	2	0	0	5	4	BSC
2	22CST401	Foundations of Data Science	L	3	0	0	0	3	3	PCC
3	22CYT401	Operating Systems and Security	L	3	0	0	0	3	3	PCC
4	**22CYT402**	**Distributed Systems / ICC4*** **	L+P	3	0	2	0	5	4	PCC
5	22EST401	Environmental Sciences and Sustainability	L	2	0	0	0	2	2	ESC
MANDATORY COURSES										
		NCC/NSS/YRC Credit Course Level- I	-	**1**	**0**	**0**	**0**	**1**	**1#**	-
PRACTICAL COURSES										
6	22CSP401	Data Science Laboratory	P	0	0	3	0	3	1.5	PCC
7	22CYP401	Operating Systems Laboratory	P	0	0	3	0	3	1.5	PCC
EMPLOYABILITY ENHANCEMENT COURSE										
8	22EEP401	Quantitative Analysis and Logical Reasoning-I	P	0	0	2	0	2	1	EEC
			TOTAL	**15**	**02**	**10**	**00**	**30**	**20**	

***Common to all Branches**

**** Common to all Branches, selection from one minor vertical/approved honors subjects**

*****Industry Core Courses**

L-Theory T-Tutorial P-Practical J-Project TCP-Total Credit Period
C – Credit CAT- CATEGORY

SEMESTER V

S.No	COURSE CODE	COURSE TITLE	MODE	PERIODS PER WEEK				TCP	C	CAT
				L	T	P	J			
THEORY COURSES										
1	**22CYT501**	**Artificial Intelligence and Machine Learning / ICC5*** **	L+P	3	0	2	0	5	4	PCC
2	22CYT502	Cryptography and Cyber Security	L	3	0	0	0	3	3	PCC
3	22CYT503	Computer Networks	L	3	0	0	0	3	3	PCC
MANAGEMENT ELECTIVE										
4		Management Elective	L	3	0	0	0	3	3	HSMC
EMPLOYABILITY ENHANCEMENT COURSE										
5	22EET501	Engineering Economics and Financial Management	L	3	0	0	0	3	3	EEC
MANDATORY COURSE										
6		Mandatory Course - I	L	3	0	0	0	3	0	MCC
PRACTICAL COURSES										
7	22CYP501	Cryptography and Cyber Security Laboratory	P	0	0	4	0	4	2	PCC
8	22CYP502	Computer Networks Laboratory	P	0	0	4	0	4	2	PCC
EMPLOYABILITY ENHANCEMENT COURSE										
9	22EEP502	Internship*	P	0	0	0	0	0	1	EEC
			TOTAL	**18**	**00**	**08**	**00**	**32**	**21**	

L- Lecture **T- Tutorial** **P- Practical** **J- Project** **TCP- Total Contact Periods**

C- Credits **CAT- Category**

*** Common to all branches**

**** Common to all branches, selection from one minor vertical/approved honors subjects**

*****Industry Core Courses**

SEMESTER VI

S.No	COURS ECODE	COURSE TITLE	MODE	PERIODS PER WEEK				TCP	C	CAT
				L	T	P	J			
THEORY COURSES										
1	**22CYT601**	**Network Security / ICC6 *****	L	3	0	0	0	3	3	PCC
2	22CYT602	Cyber Forensics	L+J	3	0	0	2	5	4	PCC
OPEN ELECTIVE										
3		Open Elective-I	L	3	0	0	0	3	3	OEC
PROFESSIONAL ELECTIVE										
4		Professional Elective – I	L	2	0	2	0	4	3	PEC
5		Professional Elective – II	L	2	0	2	0	4	3	PEC
MANDATORY COURSE										
6		Mandatory Course - II	T	3	0	0	0	3	0	MCC
7		NCC/NSS/YRC Credit Course Level- III	-	1	0	0	0	1	1#	-
ENROLLMENT FOR B.E. / B.TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)										
8		Minor/ Honor / Remedial class**		3	0	0	0	3	3**	PEC**
PRACTICAL COURSES - EMPLOYABILITY ENHANCEMENT COURSE										
9	22EEP601	Quantitative Analysis and Logical Reasoning-II	P	0	0	2	0	2	1	EEC
10	22EEP602	Comprehensive Assessment*	-	0	0	2	0	2	1	EEC
PRACTICAL COURSES										
11	22CYP601	Network Security Laboratory	P	0	0	4	0	4	2	PCC
			TOTAL	**22**	**00**	**08**	**02**	**30**	**20**	

L- Lecture T- Tutorial P- Practical J- Project TCP- Total ContactPeriodsC- Credits CAT- Category

*** Common to all branches**

**** Common to all branches, selection from one minor vertical / approved honors subjects**

***** Industry Core Courses**

SEMESTER VII

S.No	COURSE CODE	COURSE TITLE	MODE	PERIODS PER WEEK				TCP	C	CAT
				L	T	P	J			
THEORY COURSES										
1	**22CYT701**	**Cloud Computing / ICC7*** **	L	3	0	0	0	3	3	PCC
OPEN ELECTIVE										
2		Open Elective-II	L	3	0	0	0	3	3	OEC
PROFESSIONAL ELECTIVE										
3		Professional Elective- III	L	2	0	2	0	4	3	PEC
4		Professional Elective- IV	L	2	0	2	0	4	3	PEC
5		Professional Elective- V	L	2	0	2	0	4	3	PEC
ENROLLMENT FOR B.E. / B.TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)										
6		Minor/ Honor / Remedial class **	T	3	0	0	0	3	3**	PEC**
PRACTICAL COURSES										
7	22CSP701	Cloud Computing Laboratory	P	0	0	4	0	4	2	PCC
PRACTICAL COURSES - EMPLOYABILITY ENHANCEMENT COURSE										
8	22EEP701	Product Design and Development*	J	0	0	0	4	4	2	EEC
9		Internship*	P	0	0	0	0	0	1	EEC
			TOTAL	**18**	**00**	**04**	**06**	**28**	**20**	

L- Lecture T- Tutorial P- Practical J- Project TCP- Total Contact PeriodsC- Credits CAT- Category

*** Common to all branches**

**** Common to all branches, selection from one minor vertical/approved honors subjects**

***Industry Core Courses**

SEMESTER VIII

S.No	COURSE CODE	COURSE TITLE	MODE	PERIODS PER WEEK				TCP	C	CAT
				L	T	P	J			
THEORY COURSES - PROFESSIONAL ELECTIVE										
1		Professional Elective-VI	L	3	0	0	0	3	3	PEC
ENROLLMENT FOR B.E. / B.TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)										
2		Minor/ Honor / Remedial class **	L	3	0	0	0	3	3**	PEC**
PRACTICAL COURSES - EMPLOYABILITY ENHANCEMENT COURSE										
3	22CSP801	Project Work	J	0	0	0	16	16	8	EEC
			TOTAL	**06**	**00**	**00**	**16**	**22**	**11**	

L- Lecture T- Tutorial P- Practical J- Project TCP- Total Contact Periods
C- Credits CAT- Category

**** Common to all branches, selection from one minor vertical/approved honors subjects**

Following is the Industry Core Courses (ICC) which will be offered asChoice Based Courses in the following semesters

S.No	COURSE CODE	COURSE TITLE	MODE	PERIODS PER WEEK				TCP	C	CAT
				L	T	P	J			
1	ICC1	Python programming	L	3	0	0	0	3	3	ICC
2	ICC2	RDBMS / SQL	L	3	0	0	0	3	3	ICC
3	ICC3	Front End Technologies	L + P	3	0	2	0	5	4	ICC
4	ICC4	Identity and Access Management	L+P	3	0	2	0	5	4	ICC
5	ICC5	Design Thinking / Devops / Agile	L+P	3	0	2	0	5	4	ICC
6	ICC6	Data Security Systems (with Guardium)	L	3	0	0	0	3	3	ICC
7	ICC7	Security Intelligence Engineer (Q Radar)	L	3	0	0	0	3	3	ICC
			TOTAL	**21**	**0**	**6**	**0**	**27**	**24**	

CREDIT DISTRIBUTION

Semester	HSMC	BSC	ESC	PCC	PEC	OEC	EEC	MC	TOTAL	Total PER %
I	05	12	05	-	-	-	03	-	**25**	**15**
II	05	04	09	06	-	-	02	-	**26**	**16**
III	02	-	-	17	-	-	01	-	**20**	**12**
IV	-	04	02	13	-	-	01	-	**20**	**12**
V	03	-	-	14		-	04	-	**21**	**13**
VI	-	-	-	09	06	03	02	-	**20**	**12**
VII	-	-	-	05	09	03	03	-	**20**	**12**
VIII	-	-	-	-	03	-	08	-	**11**	**7**
TOTAL	**15**	**20**	**16**	**64**	**18**	**06**	**24**	**-**	**163**	**100**

CATEGORY		Breakup of Credits	PER % in Total
HSMC	Humanities & Social Science Including Management	**15**	**9**
BSC	Basic Science Courses	**20**	**12**
ESC	Engineering Science Courses	**16**	**10**
PCC	Professional Core Courses	**64**	**39**
PEC	Professional Elective Courses	**18**	**11**
OEC	Open Elective Courses	**06**	**4**
EEC	Employment Enhancement Courses	**24**	**15**
MCC	Mandatory Courses	**-**	**-**
	Total Credits	**163**	**100**

PROFESSIONAL ELECTIVES COURSES: VERTICALS

VERTICAL 1	VERTICAL 2	VERTICAL 3	VERTICAL 4
CYBER SECURITY AND DATA PRIVACY	**CLOUD COMPUTING AND DATA CENTRE TECHNOLOGIES**	**EMERGING TECHNOLOGIES**	**ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**
Ethical Hacking	Cloud Computing	Augmented Reality/Virtual Reality	Knowledge Engineering
Digital And Mobile Forensics	Virtualization	Robotic ProcessAutomation	Soft Computing
Social NetworkSecurity	Cloud Services Management	Neural Networks and Deep Learning	Big Data Analytics
Modern Cryptography	Data Warehousing	Cyber Security	Text And SpeechAnalysis
Engineering Secure SoftwareSystems	Data Mining	Quantum Computing	OptimizationTechniques
Cryptocurrency and BlockchainTechnologies	Software Defined Networks	Compiler Design	Game Theory
Network Security	Stream Processing	Game Development	Cognitive Science
Web Application Security	Security and Privacy In Cloud	Drone Technology	Computer Vision

PROFESSIONALS ELECTIVES COURSES: VERTICALS

Professional Electives-I Cyber Security and Data Privacy								
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**J**	**Contact Hours**	**Credits**
1.	22PEDS01	Ethical Hacking	2	0	2	0	4	3
2.	22PEDS02	Digital And Mobile Forensics	2	0	2	0	4	3
3.	22PEDS03	Social NetworkSecurity	2	0	2	0	4	3
4.	22PEDS04	Modern Cryptography	2	0	2	0	4	3
5.	22PEDS05	Engineering Secure Software	2	0	2	0	4	3
6.	22PEDS06	Cryptocurrency and BlockchainTechnologies	2	0	2	0	4	3
7.	22PEDS07	Network Security	2	0	2	0	4	3
8.	22PEDS08	Web Application Security	2	0	2	0	4	3

Professional Electives-IV Cloud Computing and Data Centre Technologies								
S. No	**Course Code**	**Course Name**	**L**	**T**	**P**	**J**	**Contact Hours**	**Credits**
1	22PECC01	Cloud Computing	2	0	2	0	4	3
2	22PECC02	Virtualization	2	0	2	0	4	3
3	22PECC03	Cloud Services Management	2	0	2	0	4	3
4	22PECC04	Data Warehousing	2	0	2	0	4	3
5	22PECC05	Data Mining	3	0	0	0	3	3
6	22PECC06	Software Defined Networks	2	0	2	0	4	3
7	22PECC07	Stream Processing	2	0	2	0	4	3
8	22PECC08	Security and Privacy In Cloud	2	0	2	0	4	3

Professional Electives-VI
Emerging Technologies

S.No	Course Code	Course Name	L	T	P	J	Contact Hours	Credits
1	22PEET01	Augmented Reality/Virtual Reality	2	0	2	0	4	3
2	22PEET02	Robotic Process Automation	2	0	2	0	4	3
3	22PEET03	Neural Networks and Deep Learning	2	0	2	0	4	3
4	22PEET04	Cyber security	2	0	2	0	4	3
5	22PEET05	Quantum Computing	2	0	2	0	4	3
6	22PEET06	Cryptocurrency and Block chain Technologies	2	0	2	0	4	3
7	22PEET07	Game Development	2	0	2	0	4	3
8	22PEET08	3D Printing and Design	2	0	2	0	4	3

Professional Electives-VII
Artificial Intelligence and Machine Learning

S.No	Course Code	Course Name	L	T	P	J	Contact Hours	Credits
1	22PEAI01	Knowledge Engineering	2	0	2	0	4	3
2	22PEAI02	Soft Computing	2	0	2	0	4	3
3	22PEAI03	Big Data Analytics	2	0	2	0	4	3
4	22PEAI04	Text And SpeechAnalysis	2	0	2	0	4	3
5	22PEAI05	OptimizationTechniques	2	0	2	0	4	3
6	22PEAI06	Game Theory	2	0	2	0	4	3
7	22PEAI07	Cognitive Science	2	0	2	0	4	3
8	22PEAI08	Computer Vision	2	0	2	0	4	3

MANDATORY COURSES I
(Semester V)

S.No	Course Code	Course Name	L	T	P	J	Contact Hours	Credits
1	22MCT001	Introduction to Women and Gender Studies	3	0	0	0	3	0
2	22 MCT002	Elements of Literature	3	0	0	0	3	0
3	22 MCT003	Film Appreciation	3	0	0	0	3	0
4	22MCT004	Well Being with Traditional Practices (Yoga, Ayurveda and Siddha)	3	0	0	0	3	0
5	22MCT006	Indian Constitution	3	0	0	0	3	0
6	22MCT007	Industrial Safety	3	0	0	0	3	0

MANDATORY COURSES II
(Semester VI)

S.No	Course Code	Course Name	L	T	P	J	Contact Hours	Credits
1	22 MCT008	Essential of Indian Traditional Values	3	0	0	0	3	0
2	22 MCT009	History of Science and Technology in India	3	0	0	0	3	0
3	22MCT010	Political and Economic Thought for a Humane Society	3	0	0	0	3	0
4	22MCT011	State, Nation Building and Politics in India	3	0	0	0	3	0
5	22MCT012	Disaster Management	3	0	0	0	3	0

LANGUAGE ELECTIVE COURSES
(Semester II)

S.No	Course Code	Course Name	L	T	P	J	Contact Hours	Credits
1	22LET201	Functional English	3	0	2	0	5	4
2	22LET202	French Language	3	0	2	0	5	4
3	22LET203	German Language	3	0	2	0	5	4
4	22LET204	Japanese Language	3	0	2	0	5	4

OPEN ELECTIVES

(Students shall choose the open elective courses, such that the course contents are not similarto any other course contents/title under other course categories).

OPEN ELECTIVE I

S.No	Course Code	Course Name	L	T	P	J	Contact Hours	Credits
1	22RAO001	Robotics	3	0	0	0	3	3
2	22RAO002	Selection of Materials	3	0	0	0	3	3
3	22RAO003	Testing of Materials	3	0	0	0	3	3
4	22RAO004	Marine Vehicles	3	0	0	0	3	3
5	22RAO005	Introduction To Nanotechnology	3	0	0	0	3	3
6	22RAO006	Lean Manufacturing	3	0	0	0	3	3
7	22ADO001	Ethics in Data Science	2	0	2	0	4	3
8	22ADO002	Software Testing	2	0	2	0	4	3
9	22ADO003	Principles of Programming Language	2	0	2	0	4	3
10	22ADO004	Digital Marketing	2	0	2	0	4	3
11	22BMO001	Biology for Engineer	3	0	0	0	3	3
12	22BMO002	Basic of Biomedical Instrumentation	3	0	0	0	3	3
13	22BMO003	Basics of Bioinformatics	3	0	0	0	3	3
14	22BMO004	Biomedical Nanotechnology	3	0	0	0	3	3
15	22ECO001	Arduino for Engineers	3	0	0	0	3	3
16	22ECO002	Introduction to Embedded system	3	0	0	0	3	3
17	22ECO003	Space Time Wireless Communication	3	0	0	0	3	3
18	22ECO004	Telecommunication Network Management	3	0	0	0	3	3
19	22CSO001	System Software	3	0	0	0	3	3
20	22CSO002	Computer Graphics	3	0	0	0	3	3
21	22CSO003	Mobile Application Development	3	0	0	0	3	3

OPEN ELECTIVE II

S.No	Course Code	Course Name	L	T	P	J	Contact Hours	Credits
1	22RAO007	Fundamentals of Combustion	3	0	0	0	3	3
2	22RAO008	Basics in Manufacturing and Metal Cutting Process	3	0	0	0	3	3
3	22RAO009	Fundamentals of Planetary Remote Sensing	3	0	0	0	3	3
4	22RAO010	Lean Six Sigma	3	0	0	0	3	3
5	22RAO011	Low Cost Automation	3	0	0	0	3	3
6	22RAO012	Production of Automotive Components	3	0	0	0	3	3
7	22ADO005	Professional Ethics	2	0	2	0	4	3
8	22ADO006	Cloud Computing	2	0	2	0	4	3
9	22ADO007	Cloud Service Management	2	0	2	0	4	3
10	22ADO008	Operating System	2	0	2	0	4	3
11	22BMO005	Troubleshooting in Medical Devices	3	0	0	0	3	3
12	22BMO006	Quality Assurance and Safety in Hospitals	3	0	0	0	3	3
13	22BMO007	Medical Electronics	3	0	0	0	3	3
14	22BMO008	Assist Devices	3	0	0	0	3	3
15	22ECO005	Introduction to Industrial Engineering	3	0	0	0	3	3
16	22ECO006	Space Engineering	3	0	0	0	3	3
17	22ECO007	Wavelet and its Applications	3	0	0	0	3	3
18	22ECO008	Introduction to Control Systems	3	0	0	0	3	3
19	22CSO004	Ubiquitous Computing	3	0	0	0	3	3
20	22CSO005	User Interface Design	3	0	0	0	3	3
21	22CSO006	Multimedia Systems	3	0	0	0	3	3

ENROLLMENT FOR B.E. / B. TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree.

For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester III onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only.

For minor degree, a student shall register for the additional courses (18 credits) from semester III onwards. All these courses have to be in a particular vertical from any one of the other programmes, Moreover, for minor degree the student can register for courses from any one of the following verticals also.

SEMESTER I

Course Code	Course Title	L	T	P	J	C
22HST101	PROFESSIONAL ENGLISH	2	0	4	0	4
		Syllabus version			v. 1.1	

COURSE OBJECTIVES:

The course enables the learner to

1. Provide learners with basic vocabulary and grammar to recognise and use in real time contexts
2. Improve communicative competence
3. Help use the language effectively in academic /work contexts
4. Build language skills by engaging in listening, speaking, vocabulary and grammar learning activities relevant to authentic contexts
5. Develop the ability to read and write complex texts, summaries, articles, blogs, definitions, essays, and user manuals

COURSE OUTCOME:

After the completion of this course, the students should be able to

1. Become accustomed to the basic vocabulary and grammar
2. Listen and comprehend complex academic texts
3. Read and infer the denotative and connotative meanings of technical texts
4. Write definitions, descriptions, narrations, and essays on various topics
5. Speak fluently and accurately in formal and informal communicative contexts

UNIT-1	INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION	6 HOURS

Reading – Newspaper- sports/health; technical Brochures
Writing – Professional emails; Formal letters - Requisition & Business letters
Grammar – Word formation, Parts of speech, Framing questions
Vocabulary – Synonyms and Antonyms, One word substitution, Abbreviations and Acronyms

UNIT-2	NARRATION AND SUMMATION	6 HOURS

Reading – Biographies/ Travelogues
Writing - Guided writing- Paragraph; Short Report on an event (field trip etc.)
Grammar – Tenses; Subject-Verb Agreement; Prepositions
Vocabulary – Narrative vocabulary; Phrasal verbs

UNIT-3	DESCRIPTION OF A PROCESS / PRODUCT	6 HOURS

Reading – Gadget reviews; Advertisements
Writing - Product description, Process description; Instruction writing
Grammar – Imperatives; Degrees of comparison
Vocabulary – Compound words; Homonyms, homophones; discourse markers- Connectives and Sequence words

UNIT-4	CLASSIFICATION ND RECOMMENDATIONS	6 HOURS

Reading – Newspaper articles; journal reports **Writing** – Note-making; Interpretation of charts; Recommendations **Gramma**r – Articles; Modal verbs **Vocabulary -** Collocations; Fixed / Semi fixed expressions.		
UNIT-5	**EXPRESSION**	**6 HOURS**
Reading – Editorials; opinion blogs **Writing** – Reports – Accident & Survey; Business letters **Grammar** – Punctuation; Negations; Simple, Complex and Compound sentences **Vocabulary -** Cause & Effect Expressions; Content vs Function words		
	TOTAL HOURS:	**30 HOURS**

TEXT BOOK(S):	
1.	Hewings, Martin Advanced Grammar In Use. New Delhi: CUP,2008 MLA Handbook for Writers of Research Papers, 7th Edition
2.	English for Science & Technology Cambridge University Press, 2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.
REFERENCE BOOKS:	
1	Ian wood, Anne Williams with Anna Cowper, "Pass Cambridge BEC Preliminary", 2nd edition, Cengage Learning, 2015.
2	Technical Communication – Principles And Practices, Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
3	A Course Book On Technical English By Lakshminarayanan, Scitech Publications (India) Pvt. Ltd.
4	

LIST OF EXPERIMENTS :
1. Listening to introductions of successful people
2. Self-Introduction and introducing a friend
3. Listening and filling out a form
4. Narrating a story using hints
5. Listening to telephone conversation
6. Telephonic Interview- Role play
Listening to podcasts, anecdotes/event narration
Narrating personal experiences/ events
Listening to celebrity interviews
Conversation Skills- Politeness strategies
Listening to process descriptions
Describing a process
Listening to travelogues

Narrating travel experiences
Listening to educational videos
Group discussion
Listening to TED Talks
Mini Presentations
Listening to description of art work
Picture description
Listening to scientific lectures
Summarizing a lecture
Listening to definitions/ descriptions of objects
One minute speech - Describing an object
Listening to Tv shows
Anchoring a reality show
Listening to advertisements
Adzap
Listening to autobiography
TOTAL HOURS: 60 HOURS

Course Code	Course Title	L	T	P	J	C
22BST101	BASIC MATHEMATICS FOR ENGINEERS	3	2	0	0	4
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

After studying this course, you should be able to:

1. To develop the use of matrix algebra techniques that are needed by engineers for practical applications.
2. To acquaint the students with differential calculus.
3. To explain the student with functions of several variables.
4. To make the students understand various techniques of integration and its applications.
5. To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

COURSE OUTCOME:

After completion of this course, the students should be able to

1. Use the matrix algebra methods for solving practical problems.
2. Apply differential calculus tools in solving various application problems.
3. Able to use differential calculus ideas on several variable functions.
4. Apply different methods of integration in solving practical problems.
5. Apply multiple integral ideas in solving areas, volumes and other practical problems.

UNIT-1	MATRICES	9+3 HOURS

Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley - Hamilton theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation

UNIT-2	DIFFERENTIAL CALCULUS	9+3 HOURS

Representation of functions - Limit of a function- Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Logarithmic differentiation - Maxima and Minima of functions of one variable.

UNIT-3	FUNCTIONS OF SEVERAL VARIABLES	9+3 HOURS

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Taylor's series for functions of two variables – Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.

UNIT-4	INTEGRAL CALCULUS	9+3 HOURS

Definite and Indefinite integrals - Substitution rule - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction

UNIT-5	MULTIPLE INTEGRALS	9+3 HOURS

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids

	TOTAL LECTURE AND TUTORIAL HOURS:	**45+15 HOURS**
TEXT BOOK(S):		
1.	Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons,10th Edition, New Delhi, 2016.	
2.	Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition , 2018.	
3.	James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015. [For Units II & IV - Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].	
REFERENCE BOOKS:		
1.	Anton. H, Bivens. I and Davis. S, "Calculus", Wiley, 10th Edition, 2016	
2.	Bali. N., Goyal. M. and Watkins. C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.	
3.	Jain. R.K. and Iyengar. S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2016.	
4.	Narayanan. S. and Manicavachagom Pillai. T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.	
5.	Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.	
6.	Srimantha Pal and Bhunia. S.C, "Engineering Mathematics" Oxford University Press, 2015.	
7.	Thomas. G. B., Hass. J, and Weir. M.D, " Thomas Calculus", 14th Edition, Pearson India, 2018.	

Course Code	Course Title	L	T	P	J	C
22BST102	ENGINEERING PHYSICS	3	0	0	0	3
	NIL	Syllabus version			v. 1.0	

COURSE OBJECTIVES:

1. To make the students effectively achieve an understanding of mechanics.
2. To enable the students to gain knowledge of electromagnetic waves and its applications.
3. To introduce the basics of oscillations, optics and lasers.
4. Equipping the students to successfully understand the importance of quantum physics.
5. To motivate the students towards the applications of quantum mechanics.

COURSE OUTCOME:

After completion of this course, the students should be able to

CO1: Understand the importance of mechanics.

CO2: Express their knowledge in electromagnetic waves.

CO3: Demonstrate a strong foundational knowledge in oscillations, optics and lasers.

CO4: Understand the importance of quantum physics.

CO5: Comprehend and apply quantum mechanical principles towards the formation of energy bands

UNIT I	MECHANICS	9 hours

Multi-particle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of the system of particles. Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy and moment of inertia - MI of a diatomic molecule - theorems of MI –moment of inertia of continuous bodies –- torque – rotational dynamics of rigid bodies – conservation of angular momentum – rotational energy state of a rigid diatomic molecule.

UNIT II	ELECTROMAGNETIC WAVES	9 hours

The Maxwell's equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure – basic introduction to Satellite Communication (qualitative treatment)

UNIT III	OSCILLATIONS, OPTICS AND LASER	9 hours

Simple harmonic motion - resonance –analogy between electrical and mechanical oscillating systems - waves on a string - standing waves - traveling waves - Energy transfer of a wave -– interference–Michelson interferometer – Theory of laser – characteristics - Spontaneous and stimulated emission - Einstein's coefficients - population inversion - Nd-YAG laser, CO2 laser, semiconductor laser –Basic applications of lasers in industry.

UNIT IV	**BASIC QUANTUM MECHANICS**	**9 hours**
Photons and light waves - Electrons and matter waves – Photoelectric effect - The Schrodinger equation (Time dependent and time independent forms) - interpretation of wave function –Free particle - particle in an infinite potential well: 1D,2D and 3D Boxes- Normalization and probabilities – Bohr's correspondence principle (concept only).		
UNIT V	**APPLIED QUANTUM MECHANICS**	**9 hours**
The harmonic oscillator(qualitative)- Barrier penetration and quantum tunnelling (qualitative)- Tunnelling microscope - Resonant diode – Principle of quantum superposition – concept of quantum entanglement – concepts of quantum communication and quantum teleportation		
	Total Lecture hours:	**45 hours**

Text Book(s)

1.	D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017.
2.	E.M.Purcell and D.J.Morin, Electricity and Magnetism, Cambridge Univ.Press, 2013.
3.	Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGraw- Hill (Indian Edition), 2017.

Reference Books

1.	R. Wolfson. Essential University Physics. Volume 1 & 2. Pearson Education (Indian Edition), 2009.
2.	Paul A. Tipler, Physic – Volume 1 & 2, CBS, (Indian Edition), 2004.
3.	K. Thyagarajan and A.Ghatak. Lasers: Fundamentals and Applications, Laxmi Publications, (Indian Edition), 2019.
4.	D.Halliday, R.Resnick and J.Walker. Principles of Physics, Wiley (Indian Edition), 2015.
5.	N.Garcia, A.Damask and S.Schwarz. Physics for Computer Science Students. Springer Verlag, 2012.

Course Code	Course Title	L	T	P	J	C
22BST103	ENGINEERING CHEMISTRY	3	0	0	0	3
	NIL	Syllabus version			v. 1.0	

COURSE OBJECTIVES:

1. To inculcate a sound understanding of water quality parameters and water treatment techniques.
2. To impart knowledge on the basic principles and preparatory methods of nano materials.
3. To introduce the different polymers and composites for engineering applications.
4. To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.
5. To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.

COURSE OUTCOME:

1. To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.
2. To identify and apply basic concepts of nano science and nanotechnology in designing the synthesis of nano materials for engineering and technology applications.
3. To analyze the properties of different polymers and distinguish the polymers which can be degraded and demonstrate their usefulness and composites for material selection requirements.
4. To recommend suitable fuels for engineering processes and applications.
5. To recognize different forms of energy resources and apply them for suitable applications in energy sectors.

Unit-1	WATER AND ITS TREATMENT	9 hours

Water: Sources and impurities, Requirements of portable water, Desalination of brackish water: Reverse Osmosis. Requirements of water for industrial use, Boiler troubles: Scale and sludge, Boiler corrosion, Caustic embrittlement, Priming &foaming. Treatment of boiler feed water: Internal treatment (phosphate, colloidal, sodium aluminate and Calgon conditioning) and External treatment -Ion exchange demineralization and zeolite process. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination).

Unit-2	NANOCHEMISTRY	9 hours

Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nanomaterials: Definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

Unit-3	POLYMERS AND COMPOSITES	9 hours

Definition of biodegradable polymers- Classification of biodegradable Polymers – Advantages, conducting polymers-polyaniline, polyacetylene, recycling of e-plastic waste (waste to wealth).
Composites: Introduction: Definition & Need for composites; Constitution: Matrix materials (Polymer, matrix, metal matrix and ceramic matrix) and Reinforcement (fibre, particulates, flakes and whiskers). Properties and applications of Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.

Unit-4	FUELS AND COMBUSTION	9 hours
Fuels: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel, Knocking - octane number, diesel oil-cetane number; Power alcohol and biodiesel. Combustion of fuels: Calorific value - higher and lower calorific values, Flue gas analysis - ORSAT Method. CO_2 emission and carbon footprint.		
Unit-5	**COMPUTATIONAL CHEMISTRY AND STORAGE DEVICES**	**9 hours**
Computational chemistry-molecular dynamics and chemical reactivity. Cheminformatics and Green IOT in biomedical applications, Artificial intelligence and machine learning methods to predict physicochemical properties. Batteries: a brief introduction to electrochemical cell (Daniel cell), Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion- battery; battery used in Electric vehicles; Fuel cells: H_2-O_2 fuel cell, microbial fuel cell; Super capacitors: Storage principle, types and examples.		
	Total Lecture hours:	**45 hours**

Text Book(s)

1.	P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
2.	Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.
3.	S.S. Dara, "A Text book of Engineering Chemistry", S. Chand Publishing, 12th Edition.

Reference Books

1.	B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Textbook of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
2.	O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
3.	Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
4.	ShikhaAgarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
5.	O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.

Course Code	Course Title	L	T	P	J	C
22EST101	PROBLEM SOLVING AND PYTHON PROGRAMMING	3	0	0	0	3
		Syllabus version			v. 1.0	

Course Objectives:

1. To understand the basics of algorithmic problem solving.
2. To learn to solve problems using Python conditionals and loops.
3. To define Python functions and use function calls to solve problems.
4. To use Python data structures - lists, tuples, dictionaries to represent complex data.
5. To do input/output with files in Python.

Course Outcome:

After completion of this course, the students should be able to

1. Develop algorithmic solutions to simple computational problems.
2. Develop and execute simple Python programs.
3. Write simple Python programs using conditionals and loops for solving problems.
4. Decompose a Python program into functions.
5. Represent compound data using Python lists, tuples, dictionaries etc.
6. Read and write data from/to files in Python programs.

UNIT-1	COMPUTATIONAL THINKING AND PROBLEM SOLVING	9 HOURS

Fundamentals of Computing — Identification of Computational Problems -Algorithms, buildingblocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT-2	DATA TYPES, EXPRESSIONS, STATEMENTS	9 HOURS

Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT-3	CONTROL FLOW, FUNCTIONS, STRINGS	9 HOURS

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT-4	**LISTS, TUPLES, DICTIONARIES**	**9 HOURS**
Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.		
UNIT-5	**FILES, MODULES, PACKAGES**	**9 HOURS**
Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).		
	TOTAL LECTURE HOURS:	**45 HOURS**

TEXT BOOK(S):

1.	Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2ndEdition,O'Reilly Publishers, 2016.
2.	Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017

REFERENCE BOOKS:

1.	Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2.	G Venkatesh and Madhavan Mukund,"Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
3.	John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021
4.	Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction To Programming", 2nd Edition, No Starch Press, 2019.

Course Code	Course Title	L	T	P	J	C
ICC1	PYTHON PROGRAMMING	3	0	0	0	3
		Syllabus version			v. 1.0	

Unit-1	INTRODUCTION TO PYTHON	09 hours

Introduction – Installation of Python - basic variables and stings - Mathematical operators -Input data – If and elseif statement – While loop – Working with Lists – For Statement.

Unit-2	PYTHON LIBRARIES	09 hours

To Install Pandas – Working with series and data frame – Grouping – aggregating – applying different functions on data – Merge and Join the data.

Unit-3	ERROR HANDLING TECHNIQUES	09 hours

Syntax errors – Exception handling – Regular expression – Pattern Matching – Parse data.

Unit-4	REGRESSION TECHNIQUES	09 hours

Definition of Regression Analysis – Working with regression analysis – Exploratory analysis – Correlation matrix – Perform visualization using matplotlib – Implementation of linear regression.

Unit-5	ALGORITHMS	09 hours

Machine learning algorithms – working on support vector machine – Random forest algorithm

TOTAL LECTURE HOURS:	45 hours

Course Code	Course Title	L	T	P	J	C
22HSM101	HERITAGE OF TAMILS	0	1	0	0	1
		Syllabus version			v. 1.0	

Unit-1	LANGUAGE AND LITERATURE	03 hours

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

Unit-2	**HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE**	**03 hours**
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.		
Unit-3	**FOLK AND MARTIAL ARTS**	**03 hours**
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.		
Unit-4	**THINAI CONCEPT OF TAMILS**	**03 hours**
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.		
Unit-5	**CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE**	**03 hours**
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books		
	Total Lecture hours:	**15 hours**

TEXT BOOK(S)	
1.	The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies.)
2.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,
3.	Tamilaga Varalaru, Makalum Panpadum- Dr. K.K. Pillai
4.	Kanini Tamil- Munaivar L. Sundaram
REFERENCE BOOKS	
1.	Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2.	Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies.
3.	Historical Heritage of the Tamils (Dr. S. V. Subatamanian, Dr. K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4.	Studies in the History of India with Special Reference to Tamil Nadu (Dr. K.K. Pillay) (Published by: The Author)
5.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

Course Code	Course Title	L	T	P	J	C
22EET101	ENGINEERING AND PROFESSIONAL SKILLS	1	0	2	0	2
		Syllabus version			v. 1.0	

Course Objectives: After studying this course, you should be able to:

1. Understand the characteristics of 'engineering' and the quality engineers have played n shaping engineering up to the present and into the future
2. Understand a range of principles in science, mathematics, and engineering in order to make well-founded decisions as part of a design process
3. To be proficient in using MS WORD to create quality technical documents, by using standard templates, widely acceptable styles and formats, variety of features toenhance the present ability and overall utility value of content
4. To be proficient in using MS EXCEL for all data manipulation tasks including the common statistical, logical, mathematical etc., operations, conversion, analytics, search and explore, visualize, interlink, and utilizing many more critical featuresoffered
5. To be able to create and share quality presentations by using the features of MS PowerPoint, including: organization of content, present ability, aesthetics, using media elements and enhance the overall quality of presentations.

Course Outcome:

1. Understand the basic knowledge in evolution of engineering
2. Understand the basic knowledge in Engineering approach
3. Use the MS Word to create quality documents, by structuring and organizing contentfor their day to day technical and academic requirements
4. Use MS EXCEL to perform data operations and analytics, record, retrieve data asper requirements and visualize data for ease of understanding
5. Use MS PowerPoint to create high quality academic presentations by including Common tables, charts, graphs, interlinking other elements, and using mediaobjects.

UNIT-1	EVOLUTION OF ENGINEERING	6 HOURS

Evolution of Engineering: Description of Engineering, Early stages of Engineering, Outline of Ancient Engineering, Case studies of historic engineers. Introduction to Engineering Career: Engineering as a career and common qualities of employable engineers History of Engineering Domains Impact of engineering on society. Roles of Engineers and Career Paths.

UNIT-2	ENGINEERING APPROACH	6 HOURS
Introduction, problem statement: Detailing Customer Requirements, Setting Objectives, Identifying Constraints, Establishing Functions, generating solution Alternatives and Choosing a solution. Steps in problem-solving: Problem Solving Techniques, Six Thinking Hats, Mind Mapping, Forced Connections. Analytical Thinking, Numeric, symbolic, and graphic reasoning.seven steps in solving engineering problems, reverse engineering, forward engineering, concurrent engineering, and Value Engineering.		
UNIT-3	**MS WORD**	**6 HOURS**
Create and format a document, Working with tables, Working with Bullets and Lists, Working withstyles, shapes, smart art, charts Inserting objects, charts and importing objects from other office tools, Creating and Using document templates, Inserting equations, symbols and special characters, Working with Table of contents and References, citations Insert and review comments,Create bookmarks, hyperlinks, endnotes footnote, Viewing document in different modes, Workingwith document protection and security, Inspect document for accessibility.		
UNIT-4	**MS EXCEL**	**6 HOURS**
Create worksheets, insert and format data, Work with different types of data: text, currency, date, numeric etc. Split, validate, consolidate, Convert data Sort and filter data Perform calculations and use functions: (Statistical, Logical, Mathematical, date, Time etc.,) Work with Lookup and reference formulae, Create and Work with different types of charts, Use pivot tablesto summarize and analyze data, Perform data analysis using own formulae and functions, Combine data from multiple worksheets using own formulae and built-in functions to generate results, Export data and sheets to other file formats, Working with macros, Protecting data and Securing the workbook.		
UNIT-5	**MS POWERPOINT**	**6 HOURS**
Hours Select slide templates, layout and themes, Formatting slide content and using bullets andnumbering, Insert and format images, smart art, tables, charts Using Slide master, notes and handout master, Working with animation and transitions, Organize and Group slides Import or create and use media objects: audio, video, animation, Perform slideshow recording and Record narration and create presentable videos.		
	TOTAL LECTURE HOURS:	**30 HOURS**

TEXT BOOK(S):

1.	Remesh S., Vishnu R. G., Life Skills for Engineers, Ridhima Publications, 1st Edition,2016.
2.	Barun K. Mitra, Personality Development & Soft Skills, Oxford Publishers, Third impression, 2017.
3.	Dorothy House, Microsoft Word, Excel, and PowerPoint: Just for Beginners, Import, 29 January 2015

REFERENCE BOOKS:

1.	Paul H .Wright, Introduction to Engineering, School of Civil and EnvironmentalEngineering, 3rd Edition, John Wiley & Sons, Inc,

Course Code	Course Title	L	T	P	J	C
22ESP101	PROBLEM SOLVING AND PYTHONPROGRAMMING LABORATORY	0	0	4	0	2
		Syllabus version			v. 1.0	

Course Objectives:

1. To understand the problem solving approaches.
2. To learn the basic programming constructs in Python.
3. To practice various computing strategies for Python-based solutions to real world problems.
4. To use Python data structures - lists, tuples, dictionaries.
5. To do input/output with files in Python.

Course Outcome:

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

1. Develop algorithmic solutions to simple computational problems
2. Develop and execute simple Python programs.
3. Implement programs in Python using conditionals and loops for solving problems.
4. Deploy functions to decompose a Python program.
5. Process compound data using Python data structures.
6. Utilize Python packages in developing software applications.

LIST OF EXPERIMENTS:

Note: The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines. The Examination shall not be restricted to the sample experiments listed here.

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python programming using simple statements and expressions (exchange the valuesof two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern) Implementing real-time / technical applications using Lists, Tuples. (Items present in a library / Components of a car/ Materials required for construction of a building –operations of list & tuples)
4. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.-operations of Sets & Dictionaries)
5. Implementing programs using Functions. (Factorial, largest number in a list, areaof shape)
6. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
7. Implementing programs using written modules and Python Standard Libraries (pandas, numpy. Matplotlib, scipy)
8. Implementing real-time/technical applications using File handling. (copy from onefile to another, word count, longest word)
9. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity, student mark range validation)

Course Code	Course Title	L	T	P	J	C

10. Exploring Pygame tool. 11. Developing a game activity using Pygame like bouncing ball, car race etc.	
TOTAL HOURS:	**60HOURS**

Course Code	Course Title	L	T	P	J	C
22BSP101	**PHYSICS AND CHEMISTRY LABORATORY (CHEMISTRY)**	**0**	**0**	**4**	**0**	**2**
	NIL	Syllabus version			v. 1.0	

Course Objectives:

1. To impart practical skills in the estimation of water quality parameters by volumetry and gravimetry.
2. To familiarize the students with the estimation of impurities in aqueous solutions through electro-analytical techniques such as pH metre, potentiometry and conductometry.
3. To demonstrate the analysis of metals by UV-Visible spectroscopy.

Course Outcome:

1. To independently estimate the water quality parameters, such as acidity, alkalinity, hardness, DO, TDS, chloride and copper contents by appropriate wet chemical analyses.
2. To quantitatively analyze the impurities in aqueous solution by electroanalytical techniques.
3. To determine the amount of metal ions in aqueous samples by spectroscopic techniques.

LIST OF EXPERIMENTS: ANY SEVEN

1. Preparation of Na_2CO_3 as a primary standard and estimation of acidity of a water sample using the primary standard
2. Determination of types and amount of alkalinity in water sample.
3. Determination of total, temporary & permanent hardness of water by EDTA method.
4. Determination of DO content of water sample by Winkler's method.
5. Determination of chloride content of water sample by Argentometric method.
6. Estimation of TDS of a water sample by gravimetry.
7. Determination of strength of given hydrochloric acid using pH meter.
8. Determination of strength of acids in a mixture of acids using conductivity meter.
9. Conductometric titration of barium chloride against sodium sulphate (precipitation titration)
10. Estimation of iron content of the given solution using potentiometer.
11. Estimation of iron content of the water sample using spectrophotometer (1,10-Phenanthroline / thiocyanate method).

Total Laboratory hours:	**30hours**

Course Code	Course Title	L	T	P	J	C
22BSP101	ENGINEERING PHYSICS LABORATORY	0	0	4	0	2
	NIL	Syllabus version			v. 1.0	

COURSE OBJECTIVES:

1. To learn the proper use of various kinds of physics laboratory equipment.
2. To learn how data can be collected, presented and interpreted in a clear and concise manner.
3. To learn problem solving skills related to physics principles and interpretation of experimental data.
4. To determine error in experimental measurements and techniques used to minimize such error.
5. To make the student an active participant in each part of all lab exercises.

COURSE OUTCOME:

1. Understand the functioning of various physics laboratory equipment.
2. Use graphical models to analyse laboratory data.
3. Use mathematical models as a medium for quantitative reasoning and describing physical reality.
4. Access, process and analyse scientific information.
5. Solve problems individually and collaboratively.

LIST OF EXPERIMENTS (Any Seven Experiments)

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects.
2. Simple harmonic oscillations of cantilever.
3. non-uniform bending - Determination of Young's modulus
4. Uniform bending – Determination of Young's modulus
5. Laser- Determination of the wavelength of the laser using grating
6. Air wedge - Determination of thickness of a thin sheet/wire
7. a) Optical fibre -Determination of Numerical Aperture and acceptance angle
   b) Compact disc- Determination of width of the groove using laser.
8. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
10. Post office box -Determination of Band gap of a semiconductor.
11. Photoelectric effect
12. Michelson Interferometer.
13. Melde's string experiment
14. Experiment with lattice dynamics kit.

Total Laboratory hours:	**30hours**

Course Code	Course Title	L	T	P	J	C
22EEP101	PRODUCT TINKERING LABORATORY	0	0	2	0	1
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

1. Hands on practical training, maintenance and troubleshooting on mechanical and electrical appliances in day-to-day life.
2. Analyse single phase and three phase residential building wiring (Energy meter, fuse, earthing)
3. Understand the internal structure and layout of the computer system.
4. Learn to diagnose minor problems with the computer functioning.
5. Know the proper usage and threats of the world wide web.

COURSE OUTCOME:

1. Students will able to understand domestic wiring procedures practically.
2. Students are capable of assembling a personal computer, and can perform installation of system software like MS Windows and required device drivers.
3. Students can detect and perform minor hardware and software level troubleshooting.
4. Capacity to work on Internet & World Wide Web and make effective usage of the internet for academics.

LIST OF EXPERIMENTS:

1. **MECHANICAL EQUIPMENT STUDY**

(a) Hand drilling machine, Screw Jack and centrifugal pump

(b) Two wheeler, Refrigeration and Air Conditioning system.

2. **ELECTRICAL EQUIPMENT STUDY**

Light fittings, LED, Stabilizer, UPS, Iron box, calling bell, Fan regulator

3. ELECTRONIC EQUIPMENT STUDY

a) Study the elements of a smart phone.

b) Assembly and dismantle of LED TV.

c) Assembly and dismantle of computer/ laptop

4. COMPUTER PERIPHERALS STUDY

PC HARDWARE Identification of the peripherals of a computer, components in a CPU and its functions. Block diagram of the CPU along with the configuration of each peripheral. Functions of Motherboard. Assembling and Disassembling of PC. System Software and application software installation.

5. BIOMEDICAL EQUIPMENT

a) Assembly and dismantle of Electrocardiogram (ECG)

b) Assembly and dismantle of ventilator.

c) Assembly and dismantle of Doppler Ultra sound Scanner.

TROUBLESHOOTING

Hardware Troubleshooting: Students are to be given a PC which does not boot due to proper assembly or defective peripherals and the students should be taught to identify and correct the problem. *Software Troubleshooting*: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. *Internet:* Web Browsers, Access of websites, Surfing the Web, Search Engines, Customization of web browsers, proxy settings, bookmarks, search toolbars, pop-up blockers. Antivirus downloads, Protection from various threats.	
TOTAL LECTURE HOURS:	**30 HOURS**

SEMESTER II

Course Code	Course Title	L	T	P	J	C
22LET201	FUNCTIONAL ENGLISH	3	0	2	0	4
		Syllabus version			v. 1.1	

COURSE OBJECTIVES:

The course enables the learner to:

1. Gain confidence to respond in English in both academic and professional contexts
2. Improve presentation skills to make effective presentations
3. Foster the ability to write effectively in all contexts
4. Strengthen the skills related to teamwork and leadership roles in society as well as in the workplace

COURSE OUTCOME:

After the completion of this course, the students should be able to

1. Communicate fluently in professional situations
2. Express flexibility and appropriacy in Technical Events
3. Demonstrate complex forms and sentence structures with adequate vocabulary
4. Report events and the processes of technological & Industrial firms.
5. Present effective Profile in the context of job search

UNIT-1	COMMUNICATIVE COMPETENCE	9 HOURS

Speaking: Interactive skills- Initiation & turn taking; relevance to the topic, puzzles & riddles
Reading – Skimming, Scanning, Churning & Assimilation
Writing – Formal letters - Requisition & Business letters, Opinion paragraph
Grammar – Order of Adjectives, Primary Auxiliary Verbs
Vocabulary – Phonetics – sounds and symbols; Vocabulary used in letters and emails

UNIT-2	SITUATIONAL CONVERSATIONS	9 HOURS

Speaking – Practicing fluency- cohesion, coherence, and speed of delivery
Reading – Reading brochures and user manuals
Writing – Essay types -Compare & Contrast Essay, Argumentative Essay; Checklist
Grammar – Infinitives, Gerunds and Participles, Interrogative and Reflexive Pronoun
Vocabulary – Verbal Analogies, Same words used as different parts of speech

Unit-3	REPORT ON TECHNICAL EVENTS	9 hours

Speaking –Mock TV news Reading/ anchoring
Reading – Motivational essays on famous Engineers and Technologists
Writing – Report Writing- Survey and Accident; Project Proposals and Project Reports
Grammar – Reported Speech, Modal Verbs
Vocabulary – Technical Vocabulary, Jargon

Unit-4	DEVELOPING DISCUSSION SKILLS	9 hours

Speaking – Giving short talks on technical topics
Reading - Descriptive passages – magazines/ articles
Writing – Problem solution essay, Opinion Essay, Recommendations
Grammar – If conditional sentences, Articles
Vocabulary - Purpose statements, Vocabulary used in letters and emails

Unit-5	PRESENTATION SKILLS	9 hours

Speaking – Presentations using visual aids- Visume using appropriate body language and gestures; stating and asking for opinions and clarifications **Reading** – Predicting the content, speed reading techniques **Writing** – Precis Writing, Minutes of Meeting, Profile Writing **Grammar** – Mixed Tenses, Embedded Clause **Vocabulary** – Error Spotting, Sentence Completion	
TOTAL LECTURE HOURS:	**45 HOURS**
List of Experiments :	
1. Initiation and turn taking	
2. Writing opinion paragraph	
3. Situational conversations	
4. Writing Checklists	
5. Mock TV news reading	
6. Writing the project proposal or report	
7. Short talk on technical topics	
8. Writing recommendations	
9. PPT Presentation	
10. Profile writing	
TOTAL PRACTICAL HOURS:	**30 HOURS**
Text Book(s)	
1.	English for Engineers & Technologists (2020 edition) Orient Blackswan Private Ltd. Department of English, Anna University
2.	Functional English for Communication (2022 edition) Ujjwala Kakarla, Guru Nanak Institutions Technical Campus (Autonomous), Hyderabad.
Reference Books	
1.	Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford university press. New Delhi.
2.	Hewings, Martin. Advanced Grammar In Use. New Delhi: CUP,2008 MLA Handbook for Writers of Research Papers, 7th Edition
3.	Klaus Bruhn Jensen. A handbook of Media and Communication Research. Routledge, 2003

Unit-4	DEVELOPING DISCUSSION SKILLS	9+6 hours
Speaking – Giving short talks on technical topics **Reading -** Descriptive passages - newspapers / magazines/ articles **Writing** – Problem solution essay, Opinion Essay, Statement of Purpose, Recommendations **Grammar** – If conditional sentences, Articles **Vocabulary -** Compound Words, Abbreviations & acronyms		
Unit-5	**PRESENTATION SKILLS**	**9+6 hours**
Speaking – Presentations - visual aids- Visumes using appropriate body language and gestures,stating and asking for opinions and clarifications **Reading** – Predicting the content, speed reading techniques **Writing** – Note taking & Precis Writing, Minutes of Meeting, Profile writing **Grammar** – Mixed Tenses, Relative Clauses **Vocabulary** – Error Spotting, Sentence Completion		
	Total Lecture and Laboratory hours:	**45+30 hours**
Text Book(s)		
1.	English for Engineers & Technologists (2020 edition) Orient Blackswan Private Ltd. Department of English, Anna University	
2.	Functional English for Communication (2022 edition) Ujjwala Kakarla, Guru Nanak Institutions Technical Campus (Autonomous), Hyderabad.	
Reference Books		
1.	Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford university press. New Delhi.	
2.	Hewings, Martin.Advanced Grammar In Use. New Delhi: CUP,2008 MLA Handbook for Writers of Research Papers, 7th Edition	
3.	Klaus Bruhn Jensen. A handbook of Media and Communication Research. Routledge, 2003	

Course Code	Course Title	L	T	P	J	C
22LET202	FRENCH LANGUAGE	3	0	2	0	4
		Syllabus version			v. 1.0	

Course Objectives:

1. To acquire an understanding of basic French language parts of speech
2. To facilitate learner's ability to learn the French language grammar.
3. To nurture learner's ability to understand the sentence structure
4. To foster technical writing skills through tenses and numbers
5. To comprehend various lectures and talks

Course Outcome:

1. Read and write technical basic French language parts of speech
2. Speak appropriately learner's ability to learn the French language grammar.
3. Listen and comprehend lectures learner's ability to understand the sentence structure
4. Write correctly, clearly and concisely technical writing skills through tenses and numbers
5. Prepare self-introduction comprehend various lectures and talks

Unit-1	PARTS OF SPEECH	12 hours

1. inviter et répondre à une invitation, Pronoms sujets 2. L'article définis, l'article indéfinis

3. Conjugation : présent, adjectifs possessifs 4. interrogation, décrire les personnes 5. Lavie de quatre parisiens de professions différentes

Unit-2	ELEMENTS OF GRAMMAR	12 hours

1. Exprimer l'ordre et l'obligation demander et commander 51
2. l'adjectif possessifs, l‟article partitif, l'article démonstratif, négation ne
3. pas, l'article contracté 4. verbe pronominaux 5. prepositions

Unit-3	SENTENCE STRUCTURE	12 hours

1. Raconter et reporter-donner son avis
2. Futur simple, pronom complètement d'objet direct, passé composé
3. plusieurs région de France, imparfait, pronom y/en, imparfait

Unit-4	**TENSES AND NUMBERS**	**12 hours**
1. Demander l'autorisation-passé récent, futur proche 2. La vie administrative et régionale, Pluriel des noms, moyens de transport		
Unit-5	**DISCOURSE**	**12 hours**
1. le discours rapporté, décrire un lieu, exprimer ses préférences 2. décrire la carrière,discuter d‟système éducation de France 3. parler de la technologie de l‟information		
	TOTAL LECTURE HOURS:	45 hours

Text Book(s)	
1.	Christine Andant étal "À propos (livre de l'élève", LANGER., NEW DELHI,2012
2.	Myrna Bell Rochester "Easy French Step By Step", MCGraw Hill Companies., USA, 2008
Reference Books	
1.	Michael D. Oates "Entre Amis: An Interactive Approach", 5 th Edition, Houghton Mifflin., 2005
2.	Bette Hirsch, Chantal Thompson "Moments Literaries : An Anthology for intermediate French"
3.	Simone Renaud, Dominique van Hooff "En bonne forme

Course Code	Course Title	L	T	P	J	C
22LET203	GERMAN LANGUAGE	3	0	2	0	4
		Syllabus version			v. 1.0	

Course Objectives:

1. To acquire an understanding of basic German language parts of speech
2. To facilitate learner's ability to learn the German language grammar.
3. To nurture learner's ability to understand the sentence structure
4. To foster technical writing skills through tenses and numbers
5. To comprehend various lectures and talks

Course Outcome:

1. Read and write technical basic German language parts of speech
2. Speak appropriately learner's ability to learn the German language grammar.
3. Listen and comprehend lectures learner's ability to understand the sentencestructure
4. Write correctly, clearly and concisely technical writing skills through tenses and numbers
5. Prepare self-introduction comprehend various lectures and talks

Unit-1	GUTEN TAG!	10 hours

1. To greet, learn numbers till 20, practice telephone numbers & e mailaddress, learnalphabet, speak about countries & languages
2. Vocabulary: related to the topic
3. 3. Grammar: W – Questions, Verbs & Personal pronouns I

Unit-2	FREUNDE, KOLLEGEN UND ICH	10 hours

1. To speak about hobbies, jobs, learn numbers from 20; build dialogues andframe simplequestions & answers
2. Vocabulary: related to the topic
3. Grammar: Articles, Verbs & Personal pronouns II, sein & haben verbs, ja/nein Frage,singular/plural

Unit-3	IN DER STADT	12 hours
1. To know places, buildings, question, know transport systems, understand international words;build dialogues and write short sentences 2. Vocabulary: related to the topic 3. Grammar: Definite & indefinite articles, Negotiation, Imperative with Sien verbs		
Unit-4	**GUTEN APPETIT!**	**13 hours**
1. To speak about food, shop, converse; Vocabulary: related to the topic; build dialoguesand writeshort sentences 2. Grammar: Sentence position, Accusative, Accusative with verbs, personal pronouns &prepositions, Past tense of haben & sein verbs		
Unit-5	**TAG FŸR TAG/ZEIT MIT FREUNDEN**	**15 hours**
1. To learn time related expressions, speak about family, about birthdays, understand & writeinvitations, converse in the restaurant; ask excuse, fix appointments on phone 2. Vocabulary: related to the topic 3. Grammar: Time related prepositions, Possessive articles, Modalverbs		
	TOTAL LECTURE HOURS:	**60 hours**

Text Book(s)	
1.	Dengler Stefanie "Netzwerk A1.1", Klett-Langenscheidt Gmbh., München,2013
2.	Sandra Evans, Angela Pude "Menschen A1", Hueber Verlag., Germany, 2012
Reference Books	
1.	Stefanie Dengler "Netzwerk A1", Klett-Langenscheidt Gmbh., München, 2013
2.	Hermann Funk, Christina Kuhn "Studio d A1", Goyal Publishers & Distributors Pvt.Ltd., New Delhi, 2009
3.	Rosa-Maria Dallapiazza "Tangram Aktuell 1 (Deutsch als Fremdsprache)", MaxHueber Verlag., Munchen, 2004
4.	Christiane Lemcke und Lutz Rohrmann "‘Grammatik Intensivtrainer A 1", Goyal Publishers & Distributors Pvt. Ltd., New Delhi, 2012

Course Code	Course Title	L	T	P	J	C
22LET204	JAPANESE LANGUAGE	3	0	2	0	4
		Syllabus version			v. 1.0	

Course Objectives:

1. To acquire an understanding of basic Japanese language parts of speech
2. To facilitate learner's ability to learn the Japanese language grammar.
3. To nurture learner's ability to understand the sentence structure
4. To foster technical writing skills through tenses and numbers
5. To comprehend various lectures and talks

Course Outcome:

1. Read and write technical basic Japanese language parts of speech
2. Speak appropriately learner's ability to learn the Japanese language grammar.
3. Listen and comprehend lectures learner's ability to understand the sentencestructure
4. Write correctly, clearly and concisely technical writing skills through tenses andnumbers
5. Prepare self-introduction comprehend various lectures and talks

Unit-1	JAPANESE PEOPLE AND CULTURE	12 hours

1. Basic greetings and responses
2. Basic script–Method of writing hiragana and katakana –Combination sounds and simplewords
3. Self-introductions:"Hajimemashite" -Demonstratives "Kore", "Sore", "Are"–Demonstrative"Kono","Sono","Ano"
4. Possessive noun particle "no" –Japanese apartments: Greeting your neighbor

Unit-2	PATICLE "NI (AT)" FOR TIME	12 hours

: 1. kara (from) ~ made(until) – Particle "to (and)"
2. Time periods: Days of the week, months, time of day –Verbs (Present / future andpasttense)
3. Telephone enquiry: Asking for a phone no. And business hours- Destination particle "e".

Unit-3	LIKES AND DISLIKES	12 hours

1. Potential verbs (wakarimasu and dekimasu) – "Kara (~ because)"
2. Adverbs –Asking someone out over the phone-Verbs denoting presence
3. Introduction to Adjectives (na and ii type) -Verb groups – I, II and III – Exercises togroupverbs- Please do (te kudasai)

4. Present continuous tenses (te imasu) – Shall I? (~ mashou ka) – Describing a natural phenomenon (It is raining) (12)		
Unit-4	**DIFFERENT USAGES OF ADJECTIVES**	**12 hours**
1. Comparison –Likes and dislikes –Going to a trip- Need and desire (ga hoshii) –Wantingto…(Tabeti desu)- Going for a certain purpose (mi –ni ikimasu) 2. Choosing from a menu-Adjectives (“i” and “na” type) – Adjectives (Positive andnegativeuseage)		
Unit-5	**ROLE PLAYS IN JAPANESE**	**12 hours**
1. Framing simple questions & answers 2. Writing Short paragraphs & Dialogues 3. A demonstration on usage of chopsticks and Japanese tea party (12)		
	TOTAL LECTURE HOURS:	60 hours

Text Book(s)

1.	Minna no Nihongo, Honsatsu Roma "ji ban (Main Textbook Romanized Version)", International publisher – 3A Corporation., Tokyo, 2012

Reference Books

1.	Eri Banno et.al "Genki I: An Integrated Course in Elementary Japanese I -Workbook", ., 1999
2.	Tae Kim "A Guide to Japanese Grammar: A Japanese Approach toLearningJapanese Grammar", 2014
3.	Minna No Nihongo "Translation & Grammatical Notes In English Elementary",

Course Code	Course Title	L	T	P	J	C
22BST201	STATISTICS AND TRANSFORMS	3	1	0	0	4
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

1. This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
2. To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
3. To acquaint the student with Fourier series techniques in solving heat flow problemsused in various situations.
4. To acquaint the student with Fourier, transform techniques used in wide variety of situations.
5. To acquaint the student with Z, transform techniques used in wide variety of Situations.

COURSE OUTCOME:

1. Apply the concept of testing of hypothesis for small and large samples in real life problems.
2. Apply the basic concepts of classifications of design of experiments in the field of agriculture.
3. Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
4. Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
5. Use the effective mathematical tools for the solutions of partial differential equations By using Z transform techniques for discrete time systems.

UNIT-1	TESTING OF HYPOTHESIS	12 HOURS

Sampling distributions - Tests for single mean, proportion and difference of means (Largeand small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit

UNIT-2	DESIGN OF EXPERIMENTS	12 HOURS

One way and two-way classifications - Completely randomized design – Randomized blockdesign — Latin square design.

UNIT-3	FOURIER SERIES	12 HOURS

Dirichlet's conditions — General Fourier series — Odd and even functions — Half rangesine series — Half range cosine series — Parseval's identity — Harmonic analysis.

UNIT-4	FOURIER TRANSFORMS	12 HOURS

Fourier transform pair — Fourier sine and cosine transforms — Properties — Transforms of simple functions — Convolution theorem-Parseval's identity

UNIT-5	Z — TRANSFORMS	12 HOURS
Z-transforms — Elementary properties — Inverse Z-transform (using partial fraction and residues) — Initial and final value theorems		
	TOTAL LECTURE HOURS:	**60 HOURS**

TEXT BOOK(S)	
1.	Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2.	Grewal B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, New Delhi, 2014.
3.	Narayanan S., Manicavachagom Pillay. T. K and Ramanaiah. G "AdvancedMathematics for Engineering Students", Vol. II & III, S. Viswanathan Publishers Pvt. Ltd, Chennai, 1998.
REFERENCE BOOKS	
1.	Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", SultanChand & Sons, New Delhi, 12th Edition, 2020.
2.	Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014
3.	Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probabilityand Statistics ", Tata McGraw Hill Edition, 4th Edition, 2012.
4.	Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2010
5.	Andrews, L.C and Shivamoggi, B, "Integral Transforms for Engineers" SPIE Press,1999.
6.	Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition, Laxmi Publications Pvt. Ltd, 2014.
7.	Erwin Kreyszig, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, India, 2016.
8.	James, G., "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
9.	Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi,2016.
10.	Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

Course Code	Course Title	L	T	P	J	C
22CYTT201	SYSTEM SOFTWARE	3	0	0	0	3
		Syllabus version			v. 1.0	

Course Objectives:

1. To understand the relationship between system software and machine architecture.
2. To know the design and implementation of assemblers
3. To know the design and implementation of linkers and loaders.
4. To have an understanding of macroprocessors.
5. To have an understanding of system software tools.

Unit-1	INTRODUCTION	9 hours

System software and machine architecture – The Simplified Instructional Computer (SIC) - Machine architecture - Data and instruction formats - addressing modes - instruction sets - I/O and programming.

Unit-2	ASSEMBLERS	9 hours

Basic assembler functions - A simple SIC assembler – Assembler algorithm and data structures - Machine dependent assembler features - Instruction formats and addressing modes – Program relocation - Machine independent assembler features - Literals – Symbol-defining statements – Expressions - One pass assemblers and Multi pass assemblers - Implementation example - MASM assembler.

Unit-3	LOADERS AND LINKERS	9 hours

Basic loader functions - Design of an Absolute Loader – A Simple Bootstrap Loader - Machine dependent loader features - Relocation – Program Linking – Algorithm and Data Structures for Linking Loader - Machine-independent loader features – Automatic Library Search – Loader Options - Loader design options - Linkage Editors – Dynamic Linking – Bootstrap Loaders - Implementation example - MSDOS linker.

Unit-4	MACRO PROCESSORS	9 hours

Basic macro processor functions - Macro Definition and Expansion – Macro Processor Algorithm and data structures - Machine-independent macro processor features - Concatenation of Macro Parameters – Generation of Unique Labels – Conditional Macro Expansion – Keyword Macro Parameters-Macro within Macro-Implementation example - MASM Macro Processor – ANSI C Macro language.

Unit-5	SYSTEM SOFTWARE TOOLS	9 hours

Text editors - Overview of the Editing Process - User Interface – Editor Structure. - Interactive debugging systems - Debugging functions and capabilities – Relationship with other parts of the system – User-Interface Criteria.

	TOTAL LECTURE HOURS:	45 hours

Text Book(s)

1. Leland L. Beck, “System Software – An Introduction to Systems Programming”, 3rd Edition, Pearson Education Asia, 2006.

Reference Books	
1.	D. M. Dhamdhere, "Systems Programming and Operating Systems", Second Revised Edition, Tata McGraw-Hill, 2000.
2.	John J. Donovan "Systems Programming", Tata McGraw-Hill Edition, 2000.
3.	John R. Levine, Linkers & Loaders – Harcourt India Pvt. Ltd., Morgan Kaufmann Publishers, 2000

Course Code	Course Title	L	T	P	J	C
22CST201	OBJECT ORIENTED PROGRAMMING	2	0	2	0	3
		Syllabus version		v. 1.0		

Unit-1	CONCEPTS OF OBJECT ORIENTED PROGRAMMING	9 hours
Abstract Data types – Inheritance – Polymorphism – Object Identity – Object Modeling – Object Oriented Programming Languages – Object Oriented Databases – Object Oriented user Interfaces – Object Oriented GIS – Object Oriented Analysis – Object Oriented Design		
Unit-2	**C++ PROGRAMMING**	**9 hours**
Introduction to C++ - Keywords, Identifiers – Data types – Variables – Operators – Manipulators – Operator Overloading – Operator Precedence – Control Statements – Functions – Call by Reference – Arguments – Function Overloading		
Unit-3	**CLASSES AND OBJECTS**	**9 hours**
Classes and Objects – Member Functions – Private and Public Member function – Nesting of Member Functions – Array of Objects – Pointer to Members – Constructors – Destructors – Type Conversions		
Unit-4	**INHERITANCE AND POLYMORPHISM**	**9 hours**
Inheritance – Base class – Derived Class – Visibility modes – Single Inheritance – Multilevel Inheritance – Multiple Inheritance – Nesting – Polymorphism – File – Opening and Closing – File Modes – File Pointers – Random Access – Error Handling –		
Unit-5	**GIS CUSTOMISATION PROGRAMMING USING VISUAL BASIC**	**9 hours**
Accessing databases with the Data Controls – ADO Object Model – ODBC and data access Objects – ODBC using DAO and Remote Data Objects – Data Environment and Data Report – ActiveX Controls – GIS Customisation		
	TOTAL LECTURE HOURS:	**45 hours**

Text Book(s)	
1.	Balagurusamy.E., Object Oriented Programming with C++, Tata Mc.Graw Hill Publications, 2001
2.	Stanley B.Lippman, A C++ Primer, 2 nd Edition, Addison Wesley Publications, Second Edition 2000

Reference Books	
1.	Bjarne Stroustrup, The C++ Programming Language, Addison Wesley Publications, Third Edition, 2000.
2.	Tony Stevenson, Visual Basic 6: The Complete Reference, Osborne/ McGraw- Hill, 2000.
3.	David S. Platt, Introducing Microsoft .NET Microsoft Press, Saarc Edition, 2001.

Course Code	Course Title	L	T	P	J	C
ICC2	RDBMS / SQL	3	0	0	0	3
		Syllabus version			v. 1.0	

Unit-1	Introduction	09 hours
Database concepts – Tables – Primary keys – Foreign keys – Installation of SQLite – Dockerbased MySQL and DB2Database. Database Storage: Introduction – Database Normalization – Indexes – Configure clustered and non-clustered indexes.		

Unit-2	Database Storage and Entities / Relationships	09 hours
Introduction – Entities and Attributes – Domain – Basic Data and Documenting Relationship –Many - to - Many Relationships – Business Rules – Data Modeling versus Data Flow –Schemas.		

Unit-3	Relational data Model and Normalization	09 hours
Introduction to Relational Data Model - Understanding Relations - Primary Keys - Representing Data Relationships - Views - Data Dictionary — Introduction to Normalization - Translating an ER Diagram into Relations - Normal Forms - First Normal Form - Second Normal Form - Third Normal Form – Boyce-Codd Normal Form - Fourth Normal Form - Fifth Normal Form - Sixth Normal Form		

Unit-4	Database Design and Performance Tuning	09 hours
Introduction - Indexing - Clustering – Partitioning - Understand data definition language (DDL) - Appropriate data – Manipulating data Types - JDBC As the Fundamental Java API - JPA asthe JAVA ORM API.		

Unit-5	Database Security and SQL	09 hours
Introduction – Database Security – External threats – Internal threats – Social Remedies –Types of Backup and Recovery Strategy. SQL: Introduction – Queries in MySQL Database.		
	TOTAL LECTURE HOURS:	**45 hours**

Course Code	Course Title	L	T	P	J	C
22EST205	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	3	0	0	0	3
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

1. To introduce the basics of electric circuits and analysis
2. To impart knowledge in the basics of working principles and application of electrical machines
3. To introduce analog devices and their characteristics
4. To educate on the fundamental concepts of linear integrated circuits
5. To introduce the functional elements and working of measuring instruments.

COURSE OUTCOME:

1. Compute the electric circuit parameters for simple problems
2. Explain the working principle and applications of electrical machines
3. Analyze the characteristics of analog electronic devices
4. Explain the basic concepts of linear integrated circuits
5. Explain the operating principles of measuring instruments.

UNIT-1	**ELECTRICAL CIRCUITS**	**9 HOURS**

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws –Independent and Dependent Sources — Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state) Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLCcircuits (Simple problems only)

UNIT-2	**ELECTRICAL MACHINES**	**9 HOURS**

Construction and Working principle- DC Separately and Self Excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction, Working principle and Applications of Transformer, Threephase Alternator, Synchronous motor and Three Phase Induction Motor.

UNIT-3	**ANALOG ELECTRONICS**	**9 HOURS**

Resistor, Inductor and Capacitor in Electronic Circuits- Semiconductor Materials: Silicon &Germanium – PN Junction Diodes, Zener Diode –Characteristics Applications – Bipolar Junction Transistor-Biasing, JFET, SCR, MOSFET, IGBT – Types, I-V Characteristics and Applications, Rectifier and Inverters.

UNIT-4	**LINEAR INTEGRATED CIRCUITS**	**9 HOURS**

Ideal OP-AMP characteristics, Basic applications of op-amp — Inverting and Non-Inverting Amplifiers, summer, differentiator and Integrator-S/H circuit, D/A converter (R- 2R ladder), A/D converters- Flash type ADC using OP-AMPS. Functional block, characteristics of 555 timer–Astable multi-vibrator mode.

UNIT-5	**MEASUREMENTS AND INSTRUMENTATION**	**9 HOURS**

Functional elements of an instrument, Standards and calibration, Operating Principle , types -Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, Instrument Transformers-CT and PT,DSO- Block diagram- Data acquisition

TOTAL LECTURE HOURS:	**45 HOURS**

TEXT BOOK(S):	
1.	D P Kothari and I.J Nagrath, “Basic Electrical and Electronics Engineering”, McGraw Hill Education, Second Edition, 2020.
2.	Allan S Moris, “Measurement and Instrumentation Principles”, Third Edition, Butterworth Heinemann, 2001
3.	S.K. Bhattacharya, Basic Electrical Engineering, Pearson Education, 2019
4.	James A. Svoboda, Richard C. Dorf, “Dorf’s Introduction to Electric Circuits”, Wiley, 2018.
REFERENCE BOOKS:	
1.	Thomas L. Floyd, ‘Electronic Devices’, 10th Edition, Pearson Education, 2018
2.	A.K. Sawhney, Puneet Sawhney ‘A Course in Electrical & Electronic Measurements & Instrumentation’, Dhanpat Rai and Co, New Delhi,January 2015.
3.	Albert Malvino, David Bates, ‘Electronic Principles, McGraw Hill Education; 7th edition, 2017

Course Code	Course Title	L	T	P	J	C
22EST202	ENGINEERING GRAPHICS	1	0	4	0	3
		Syllabus version		v. 1.0		

COURSE OBJECTIVES:

1. To develop students, graphic skills for communication of concepts, ideas and design of engineering products.
2. To expose them to existing National standards related to technical drawings.
3. To Familiarize with basic geometrical constructions and orthographic projections.
4. To make the students to draw the different projections of the solids.
5. To view the true shape and apparent shape of the sectioned solids and their developments.
6. To get an idea about 3D views through isometric projections.

COURSE OUTCOME:

1. Perform basic geometrical constructions and principles of orthographic projections.
2. Project orthographic projections of lines and plane surfaces.
3. Draw projections of solids and development of surfaces.
4. Visualize and to project isometric views and conversion of Isometric views to Orthographic views.
5. Understand the basics of AUTO CAD and fundamentals of perspective projections.

UNIT-0	CONCEPTS AND CONVENTIONS (Not for Examination)	3+9 HOURS

Importance of graphics in engineering applications — Use of drafting instruments - BIS conventions and specifications — Size, layout and folding of drawing sheets — Lettering and dimensioning.

UNIT-1	PLANE CURVES	3+9 HOURS

Conic Sections - Construction of Ellipse, Parabola & hyperbola by eccentricity method – Construction of cycloid. Introduction of Orthographic projection - free hand sketch.
First angle projection - projection of points and Projection of Lines (only for understanding)

UNIT-2	PROJECTION OF PLANES AND SOLIDS	3+9 HOURS

Projection of simple planes (Square, circular, Hexagon, Pentagon) inclined to both the principal Planes by rotating object method. Projection of simple solids like Prism, Pyramid, and Cylinder &Cone when the axis is inclined to one of the principal planes by rotating object method.

UNIT-3	SECTION OF SOLIDS AND DEVELOPMENT SURFACES	3+9 HOURS

Sectioning of simple solids (Prism, Pyramid, and Cylinder& Cone) in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of surfaces of right regular sectioned solids

UNIT-4	ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS	3+9 HOURS

Principles of Isometric projections - Isometric scale- Isometric Views of simple and truncated solids. Conversion of Isometric views of the objects to Orthographic views Exercises using free hand sketching.

UNIT-5	COMPUTER AIDED DRAFTING	3+9 HOURS
Introduction to engineering graphics CAD tools, Drawing Orthographic views from Isometric views using CAD tools--Floor plans of simple buildings- Exercise of circuit diagram (2D Orthographic Views) and 3D modeling (Isometric Views) using AutoCAD Software.		
Special points applicable to University Examinations on Engineering Graphics: 1. There will be five questions, each of either or type covering all units of the syllabus. 2. All questions will carry equal marks of 20 each making a total of 100. 3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size 4. The examination will be conducted in appropriate sessions on the same day		
	TOTAL LECTURE HOURS:	**60 HOURS**

TEXT BOOK(S):

1.	Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019.
2.	Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.
3.	Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015

REFERENCE BOOKS:

1.	Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edit ion,2019.
2.	Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 27th Edition, 2017.
3.	Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4.	Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press,New Delhi, 2015.
5.	Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2ndEdition, 2009.
6.	Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P)Limited, 2008.

Course Code	Course Title	L	T	P	J	C
22HSM201	TAMILS AND TECHNOLOGY	0	1	0	0	1
		Syllabus version			v. 1.0	

Unit-1	WEAVING AND CERAMIC TECHNOLOGY	03 hours

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

Unit-2	DESIGN AND CONSTRUCTION TECHNOLOGY	03 hours

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

Unit-3	MANUFACTURING TECHNOLOGY	03 hours

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

Unit-4	AGRICULTURE AND IRRIGATION TECHNOLOGY	03 hours

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

Unit-5	SCIENTIFIC TAMIL & TAMIL COMPUTING	03 hours

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

Total Lecture hours:	15 hours

TEXT BOOK(S)

1.	The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies.)
2.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,
3.	Tamilaga Varalaru, Makalum Panpadum- Dr. K.K. Pillai
4.	Kanini Tamil- Munaivar L. Sundaram
5.	Porunai- Attrangarai Nagarigam

REFERENCE BOOKS

1.	Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2.	Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies.
3.	Historical Heritage of the Tamils (Dr. S. V. Subatamanian, Dr. K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

4.	Studies in the History of India with Special Reference to Tamil Nadu (Dr. K.K. Pillay) (Published by: The Author)
5.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
6.	Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book

Course Code	Course Title	L	T	P	J	C
22EET201	**INNOVATIONS AND DESIGN THINKING**	**2**	**0**	**0**	**0**	**2**
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

1. Learn design thinking concepts and principles
2. Use design thinking methods in every stage of the problem
3. Learn the different phases of design thinking
4. Apply various methods in design thinking to different problems
5. Apply the various the testing and implementation

COURSE OUTCOME:

1. Innovation of the new environmental conditions
2. Define key concepts of design thinking
3. Practice design thinking in all stages of problem-solving
4. Apply design thinking approach to real-world problems
5. Understand the testing and implementation

UNIT-1	**INNOVATIONS**	**6 HOURS**

Introduction, innovation in current environment, types of innovation, schools of innovation, analyzing the current business scenario, challenges of innovation, steps of innovation management, experimentation in innovation management, participation for innovation, co- creation for innovation, prototyping to incubation. blue ocean strategy –I, blue ocean strategy-
II. Marketing of innovation, technology innovation process.

UNIT-2	**DESIGN THINKING**	**6 HOURS**

Design Thinking Approach:-Introduction to Design Thinking, Iterative Design Thinking Process Stages. Design Thinking as Divergent-Convergent Questioning. Design Thinking in a Team Environment, System Thinking, Product Thinking.

UNIT-3	UNDERSTAND, OBSERVE AND DEFINE THE PROBLEM	6 HOURS
Search field determination - Problem clarification - Understanding of the problem - Problem analysis - Reformulation of the problem - Observation Phase - Empathetic design - Tips for observing - Methods for Empathetic Design - Point-of-View Phase - Characterization of the target group - Description of customer needs.		
UNIT-4	**IDEATION AND PROTOTYPING**	**6 HOURS**
Ideate Phase - The creative process and creative principles - Creativity techniques - Evaluation ofideas - Prototype Phase - Lean Startup Method for Prototype Development - Visualization and presentation techniques.		
UNIT-5	**TESTING AND IMPLEMENTATION**	**6 HOURS**
Test Phase - Tips for interviews - Tips for surveys - Kano Model - Desirability Testing - How toconduct workshops - Requirements for the space - Material requirements - Agility for Design Thinking. Design Thinking meets the corporation — The New Social Contract — Design Activism — Designing tomorrow.		
	TOTAL LECTURE HOURS:	**30 HOURS**

TEXT BOOK(S):

1.	Christian Mueller-Rotenberg, Handbook of Design Thinking - Tips & Tools for how todesign thinking.
2.	Designing for Growth: a design thinking tool kit for managers by Jeanne Liedtka andTim Ogilvie.
3.	Change by Design: How Design Thinking Transforms Organizations and InspiresInnovation by Tim Brown.
4.	John. R. Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design",Cengage Learning (International edition) Second Edition, 2013

REFERENCE BOOKS:

1.	Johnny Schneider, "Understanding Design Thinking, Lean and Agile", O'Reilly Media,2017.
2.	Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press, 2009.
3.	Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 201 4. http://ajjuliani.com/design-thinking-activities/ 5. https://venturewell.org/class-exercises
4.	Yousef Haik and Tamer M.Shahin, "Engineering Design Process", CengageLearning,Second Edition, 2011.

Course Code	Course Title	L	T	P	J	C
22ESP201	ENGINEERING PRODUCT LABORATORY	0	0	3	0	1.5
		Syllabus version			v. 2.0	

COURSE OBJECTIVES: The main learning objective of this course is to provide hands on training to the students in:

1. Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planning; making joints in wood materials used in common household wood work.
2. Wiring various electrical joints in common household electrical wire work.
3. Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.
4. Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB

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

1. Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.
2. Wire various electrical joints in common household electrical wire work.
3. Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.
4. Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

LIST OF EXPERIMENTS:

GROUP – A (CIVIL & ELECTRICAL)

PART I CIVIL ENGINEERING PRACTICES PLUMBING WORK 15

a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.

b) Preparing plumbing line sketches.

c) Laying pipe connection to the suction side of a pump

d) Laying pipe connection to the delivery side of a pump.

e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

PART II ELECTRICAL ENGINEERING PRACTICES 15

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring with introduction to CFL and LED types.
3. Stair case wiring
4. Residential house wiring using fuse, switch, indicator, lamp and energy meter.
5. Measurement of energy using single phase energy meter.

GROUP – B (MECHANICAL AND ELECTRONICS)

PART III MECHANICAL ENGINEERING PRACTICES 15

WELDING WORK:

Demonstrating welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.

BASIC MACHINING WORK:

Demonstrating of a) (simple)Turning. b) (simple)Drilling. c) (simple)Tapping.

3D PRINITNG:

Demonstrating of working principle of 3D Printer machine.

FOUNDRY WORK:

a) Demonstrating basic foundry operations

SHEET METAL WORK:

b) Making of a square tray
c) Making of a cone

FITTING EXERCISE:

Make a model by using fitting exercise

PART IV ELECTRONIC ENGINEERING PRACTICES 15

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2.Study of logic gates AND, OR, EOR and NOT.
3.Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL LABORATORY HOURS:	**60 HOURS**

Course Code	Course Title	L	T	P	J	C
22ESP203	BASIC ELECTRICAL AND ELECTRONICSENGINEERING LABORATORY	0	0	3	0	1.5
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

1. To train the students in conducting load tests on electrical machines
2. To gain practical experience in characterizing electronic devices
3. To train the students to use DSO for measurements

COURSE OUTCOME:

After completing this course, the students will be able to

1. Use experimental methods to verify the Ohm's and Kirchhoff's Laws.
2. Analyze experimentally the load characteristics of electrical machines
3. Analyze the characteristics of basic electronic devices
4. Use DSO to measure the various parameters

LIST OF EXPERIMENTS:

ELECTRICAL

1. Verification of ohms and Kirchhoff's Laws.
2. Load test on DC Shunt Motor.
3. Load test on Self Excited DC Generator
4. Load test on Single phase Transformer
5. Load Test on Induction Motor

ELECTRONICS

6. Experiment on Transistor based application circuits (Inverting and non-inverting amplifieror switching circuits) (Or) Experiments on Operational Amplifier based Inverting and non- inverting amplifier.
7. Experiments on ADC.
8. Experiments on 555 timer

MEASUREMENTS

9. Study on function of DSO.
10. Measurement of Amplitude, Frequency, Time, Phase Measurement using DSO.

TOTAL LECTURE HOURS:	**60 HOURS**

SEMESTER III

Course Code	Course Title	L	T	P	J	C
22CYT301	INTRODUCTION TO CYBER SECURITY	3	0	0	0	3
		Syllabus version			v.1.0	

COURSE OBJECTIVES:

1. To learn cybercrime and cyber law.
2. To understand the cyber-attacks and tools for mitigating them.
3. To understand information gathering.
4. To learn how to detect a cyber-attack.
5. To learn how to prevent a cyber-attack.

COURSE OUTCOME:

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

1. Explain the basics of cyber security, cybercrime and cyber law (K2)
2. Classify various types of attacks and learn the tools to launch the attacks (K2)
3. Apply various tools to perform information gathering (K3)
4. Apply intrusion techniques to detect intrusion (K3)
5. Apply intrusion prevention techniques to prevent intrusion (K3)

UNIT-1	INTRODUCTION	9 HOURS

Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime –Need for Cyber Security – History of Cyber Crime; Cybercriminals – Classification of Cybercrimes – A Global Perspective on Cyber Crimes; Cyber Laws – The Indian IT Act – Cybercrime and Punishment.

UNIT-2	ATTACKS AND COUNTER MEASURES	9 HOURS

OSWAP; Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Socialengineering Attack – Wireless Network Attack – Web Application Attack – Attack Tools – Countermeasures.

UNIT-3	RECONNAISSANCE	9 HOURS

Harvester — Whois — Netcraft — Host — Extracting Information from DNS — Extracting Information from E-mail Servers – Social Engineering Reconnaissance; Scanning – Port Scanning – Network Scanning and Vulnerability Scanning – Scanning Methodology – Ping Sweer Techniques – Nmap Command Switches – SYN – Stealth – XMAS – NULL – IDLE –FIN Scans – Banner Grabbing and OS Finger printing Techniques.

UNIT-4	**INTRUSION DETECTION**	**9 HOURS**
Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.		
UNIT-5	**INTRUSION PREVENTION**	**9 HOURS**
Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations –Intrusion Prevention Systems – Example Unified Threat Management Products.		
	TOTAL LECTURE HOURS:	**45 HOURS**

TEXT BOOK(S):	
1.	Anand Shinde, "Introduction to Cyber Security Guide to the World of Cyber Security",Notion Press, 2021 (Unit 1)
2.	Nina Godbole, Sunit Belapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley Publishers, 2011 (Unit 1)
3.	https://owasp.org/www-project-top-ten/
REFERENCE BOOKS:	
1.	David Kim, Michael G. Solomon, "Fundamentals of Information Systems Security", Jones& Bartlett Learning Publishers, 2013 (Unit 2)
2.	Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hackingand Penetration Testing Made easy", Elsevier, 2011 (Unit 3)
3.	Kimberly Graves, "CEH Official Certified Ethical hacker Review Guide", Wiley Publishers,2007 (Unit 3)
4.	William Stallings, Lawrie Brown, "Computer Security Principles and Practice", Third Edition, Pearson Education, 2015 (Units 4 and 5)

Course Code	Course Title	L	T	P	J	C
22CST302	PROGRAMMING IN JAVA	3	0	0	0	3
		Syllabus version			v.1.0	

COURSE OBJECTIVES:

1. To understand Object Oriented Programming concepts and basics of Java programminglanguage
2. To know the principles of packages, inheritance and interfaces
3. To develop a java application with threads and generics classes
4. To define exceptions and use I/O streams
5. To design and build Graphical User Interface Application using JAVAFX

COURSE OUTCOME:

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

1. Apply the concepts of classes and objects to solve simple problems
2. Develop programs using inheritance, packages and interfaces
3. Make use of exception handling mechanisms and multithreaded model to solve real world problems
4. Build Java applications with I/O packages, string classes, Collections and generics concepts
5. Integrate the concepts of event handling and JavaFX components and controls for developing GUI based applications

UNIT-1	INTRODUCTION TO OOP AND JAVA	9 HOURS

Overview of OOP – Object oriented programming paradigms – Features of Object Oriented Programming – Java Buzzwords – Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements – Programming Structures in Java – Defining classes in Java – Constructors Methods -Access specifiers – Static members- Java Doc comments.

UNIT-2	INHERITANCE, PACKAGES AND INTERFACES	9 HOURS

Overloading Methods – Objects as Parameters – Returning Objects –Static, Nested and InnerClasses. Inheritance: Basics– Types of Inheritance -Super keyword -Method Overriding – Dynamic Method Dispatch –Abstract Classes – final with Inheritance. Packages and Interfaces: Packages – Packages and Member Access –Importing Packages – Interfaces.

UNIT-3	EXCEPTION HANDLING AND MULTITHREADING	9 HOURS

Exception Handling basics – Multiple catch Clauses – Nested try Statements – Java's Built-in Exceptions – User defined Exception. Multithreaded Programming: Java Thread Model– Creating a Thread and Multiple Threads — Priorities — Synchronization — Inter Thread Communication-Suspending –Resuming, and Stopping Threads –Multithreading. Wrappers –Auto boxing.

UNIT-4	**I/O, GENERICS, STRING HANDLING**	**9 HOURS**
I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Generics: Generic Programming — Generic classes — Generic Methods — Bounded Types — Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class.		
UNIT-5	**JAVAFX EVENT HANDLING, CONTROLS ANDCOMPONENTS**	**9 HOURS**
JAVAFX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox, ToggleButton – RadioButtons – ListView – ComboBox – ChoiceBox – Text Controls– ScrollPane. Layouts – FlowPane – HBox and VBox – BorderPane – StackPane – GridPane.Menus – Basics – Menu – Menu bars – MenuItem.		
	TOTAL LECTURE HOURS:	**45 HOURS**
TEXT BOOK(S):		
1.	Herbert Schildt, "Java: The Complete Reference", 11 th Edition, McGraw Hill Education,New Delhi, 2019	
2.	Herbert Schildt, "Introducing JavaFX 8 Programming", 1 st Edition, McGraw Hill Education, New Delhi, 2015	
REFERENCE BOOKS:		
1.	Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11 th Edition, Prentice Hall, 2018.	

Course Code	Course Title	L	T	P	J	C
22CYT302	**DATABASE MANAGEMENT SYSTEMS AND SECURITY**	**3**	**0**	**0**	**0**	**3**
		Syllabus version		v.1.0		

COURSE OBJECTIVES:

1. To learn the fundamentals of data models, conceptualize and depict a databasesystem using ER diagram.
2. To study the principles to be followed to create an effective relational databaseand write SQL queries to store/retrieve data to/from database systems.
3. To know the fundamental concepts of transaction processing, concurrency control techniques and recovery procedure.
4. To understand the need of security in Database Management systems.
5. To learn how to secure Database Management systems

COURSE OUTCOME:

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

1. Model an application's data requirements using conceptual modeling and design database schemas based on the conceptual model.
2. Formulate solutions to a broad range of query problems using relational algebra / SQL.
3. Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
4. Run transactions and estimate the procedures for controlling the consequences of concurrent data access.
5. Understand and handle security issues in database management systems

UNIT-1	**RELATIONAL DATABASES**	**9 HOURS**
Data Models – Relational Data Models – Relational Algebra – Structured Query Language – Entity-Relationship Model – Mapping ER Models to Relations – Distributed Databases – Data Fragmentation — Replication		
UNIT-2	**DATABASE DESIGN**	**9 HOURS**
ER Diagrams — Functional Dependencies — Non-Loss Decomposition Functional Dependencies — First Normal Form — Second Normal Form — Third Normal Form — Dependency Preservation – Boyce-Codd Normal Form – Multi-Valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form		
UNIT-3	**TRANSACTION MANAGEMENT**	**9 HOURS**
Transaction Concepts – ACID Properties – Serializability – Transaction Isolation Levels – Concurrency Control – Need for Concurrency – Lock-Based Protocols – Deadlock Handling – Recovery System – Failure Classification – Recovery Algorithm.		
UNIT-4	**DATABASE SECURITY**	**9 HOURS**
Need for database security – SQL Injection Attacks – The Injection Technique – SQLi Attack Avenues and Types.		
UNIT-5	**ACCESS CONTROL AND ENCRYPTION**	**9 HOURS**
Database Access Control – SQL based access definition – Cascading Authorizations – Role-based access control – Inference – Database encryption		
	TOTAL LECTURE HOURS:	**45 HOURS**

TEXT BOOK(S):

1.	Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”,Seventh Edition, Tata McGraw Hill, 2021.
2.	Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, SeventhEdition, Pearson Education, 2016.
3.	William Stallings, Lawrie Brown, “Computer Security: Principles and Practice”, Fourth Edition, Pearson, 2019.

REFERENCE BOOKS:

1.	C.J. Date, A. Kannan and S. Swamynathan, “An Introduction to Database Systems”,Pearson Education, Eighth Edition, 2006.
2.	Raghu Ramakrishnan and Johannes Gehrke, “Database Management Systems”, ThirdEdition, McGraw Hill, 2014.
3.	Narain Gehani and Melliyal Annamalai, “The Database Book: Principles and PracticeUsing the Oracle Database System”, Universities Press, 2012.

Course Code	Course Title	L	T	P	J	C
22CYT303	DATA STRUCTURES	3	0	0	0	3
		Syllabus version			v.1.0	

COURSE OBJECTIVES:

1. To understand the concepts of ADTs
2. To design linear data structures – lists, stacks, and queues.
3. To understand sorting, searching, and hashing algorithms.
4. To apply Tree and Graph structures

COURSE OUTCOME:

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

1. Explain abstract data types.
2. Design, implement, and analyze linear data structures, such as lists, queues, and stacks,according to the needs of different applications.
3. Design, implement, and analyze efficient tree structures to meet requirements such as searching, indexing, and sorting.
4. Model problems as graph problems and implement efficient graph algorithms to solve them

UNIT-1	ABSTRACT DATA TYPES	9 HOURS

Abstract Data Types (ADTs) – ADTs and classes – introduction to OOP – classes in Python – inheritance – namespaces – shallow and deep copying - Introduction to analysis of algorithms – asymptotic notations – divide & conquer – recursion – analyzing recursive algorithms

UNIT-2	LINEAR STRUCTURES	9 HOURS

List ADT – array-based implementations – linked list implementations – singly linked lists – circularly linked lists – doubly linked lists – Stack ADT – Queue ADT – double ended queues – applications

UNIT-3	SORTING AND SEARCHING	9 HOURS

Bubble sort — selection sort — insertion sort — merge sort — quick sort — analysis of sorting algorithms – linear search – binary search – hashing – hash functions – collision handling –load factors, rehashing, and efficiency

UNIT-4	**TREE STRUCTURES**	**9 HOURS**
Tree ADT – Binary Tree ADT – tree traversals – binary search trees – AVL trees – heaps – multi-way search trees		
UNIT-5	**GRAPH STRUCTURES**	**9 HOURS**
Graph ADT – representations of graph – graph traversals – DAG – topological ordering – greedy algorithms – dynamic programming – shortest paths – minimum spanning trees – introduction to complexity classes and intractability		
	TOTAL LECTURE HOURS:	**45 HOURS**

TEXT BOOK(S):	
1.	Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures & Algorithms in Python", An Indian Adaptation, John Wiley & Sons Inc., 2021
REFERENCE BOOKS:	
1.	**Lee**, Kent D., **Hubbard**, Steve, "Data Structures and Algorithms with Python" Springer Edition 2015
2.	Rance D. Necaise, "Data Structures and Algorithms Using Python", John Wiley & Sons,2011
3.	Aho, Hopcroft, and Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
4.	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein,"Introduction to Algorithms", Second Edition, McGraw Hill, 2002.
5.	Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Fourth Edition, Pearson Education, 2014

Course Code	Course Title	L	T	P	J	C
22HST301	ENTREPRENEURSHIP AND STARTUPS	3	0	0	0	3
		Syllabus version			v.1.0	

COURSE OBJECTIVES:

1. To provide practical, proven tools for transforming an idea in to a product or service thatcreates value for others
2. To build a winning strategy, how to shape a unique value proposition, prepare a businessplan
3. To impart practical knowledge on business opportunities
4. To inculcate the habit of becoming an entrepreneur
5. To know the financing, growth, and new venture & its problems

COURSE OUTCOME:

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

1. Transform ideas in to real products, services and processes by validating the idea, testing it,and turning it in to a growing, profitable, and sustainable business.
2. Identifythemajorstepsandrequirementstoestimatethepotentialofaninnovativeideasthebasis ofan innovative project.
3. Reach creative solutions via an iteration of a virtually endless stream of world-changingideas and strategies, integrating feedback and learning from failures along the way.
4. Apply the ten entrepreneurial tools in creating a business plan for a new innovative venture.
5. Apply methods and strategies learned from interviews with start-up entrepreneurs and innovators.

UNIT-1	ENTREPRENEURIAL COMPETENCE	9 HOURS

Introduction to Entrepreneurship & Entrepreneur Meaning and concept of Entrepreneurship, the history of Entrepreneurship development, Myths of Entrepreneurship, the role of Entrepreneurship in Economic Development, Agencies in Entrepreneurship Management, and the Future of Entrepreneurship. The Entrepreneur: Meanstheskillsrequiredtobeanentrepreneur,theentrepreneurialdecisionprocess,Rolemodels, Mentorsand Support system.

UNIT-2	BUSINESS PLAN PREPARATION AND PROTOTYPING	9 HOURS

Business Opportunity Identification and Preparing a Business Plan Business ideas, methods ofgeneratingideas,andopportunityrecognition,IdeaGenerationProcess,Feasibilitystudy,prepari nga Business Plan: Meaning and significance of a business plan, componentsofabusinessplan.Experimentationandincubation,Participation in Innovation & Co-creation, and Prototyping

UNIT-3	ENTREPRENEURIAL ENVIRONMENT	9 HOURS

Business Environment- Role of Family and Society — Entrepreneurship Development Training and Other Support Organisational Services –Central and State Government Industrial Policies and Regulations.

UNIT-4	**LAUNCHING OF SMALL BUSINESS**	**9 HOURS**
Financing & Launching the New Venture Importance of new venture financing, types of ownership, venture capital, types of debt securities, determining ideal debt-equity mix and financial institutions and banks. Launching the New Venture: Choosing the legal form of the new venture, protection of intellectual property, and formation of the new venture.		
UNIT-5	**MANAGEMENTOFSMALLBUSINESS**	**9 HOURS**
Managing Growth & Rewards in New Venture Characteristics of high growth new ventures, strategies for growth, and building the new ventures. Managing Rewards: Exit Strategies for Entrepreneurs, Mergers and acquisitions, Succession and exit strategy, managing failures —bankruptcy-Business Sickness-Effective Management of Small Business-Case Studies.		
	TOTAL LECTURE HOURS:	**45 HOURS**

TEXTBOOK(S):	
1.	Stephen Key,"One Simple Idea for Start- ups and Entrepreneurs: Live Your Dreams and Create Your Own Profitable Company",1st Edition, Tata McGraw hill Company, NewDelhi, 2013.
2.	Charles Bamford and Garry Bruton, "ENTREPRENEURSHIP: The Art, Science, and Process for Success", 2nd Edition, Tata McGraw hill Company, NewDelhi,2016.
REFERENCEBOOKS:	
1.	Philip Auerswald, "The Coming Prosperity: How Entrepreneurs Are Transforming the Global Economy", Oxford University Press, 2012.
2.	Janet Kiholm Smith; Richard L.Smith; Richard T. Bliss, "Entrepreneurial Finance: Strategy, Valuation and Deal Structure, Stanford Economics and Finance", 2011

Course Code	Course Title	L	T	P	J	C
22CYP301	DATABASE MANAGEMENT SYSTEMS AND SECURITY LABORATORY	0	0	3	0	2
		Syllabus version			v.1.0	

COURSE OBJECTIVES:

1. To learn and implement important commands in SQL.
2. To learn the usage of nested and joint queries.
3. To understand functions, procedures and procedural extensions of databases.
4. To understand attacks on databases and to learn to defend against the attacks ondatabases.
5. To learn to store and retrieve encrypted data in databases.

COURSE OUTCOME:

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

1. Create databases with different types of key constraints.
2. Write simple and complex SQL queries using DML and DCL commands.
3. Realize database design using 3NF and BCNF.
4. Use advanced features such as stored procedures and triggers. Secure databasesand mitigate attacks on databases.

PRACTICAL EXERCISES:

1. Create a database table, add constraints (primary key, unique, check, Not null), insert rows,update and delete rows using SQL DDL and DML commands.
2. Create set of tables, add foreign key constraints and incorporate referential integrity.
3. Query the database tables using different 'where' clause conditions and also implement aggregate functions.
4. Query the database tables and explore sub queries and simple join operations.
5. Query the database tables and explore natural, equi and outer joins.
6. Write user defined functions and stored procedures in SQL.
7. Execute complex transactions and realize DCL and TCL commands.
8. Write SQL Triggers for insert, delete, and update operations in database table.
9. Use SQLi to authenticate as administrator, to get unauthorized access over sensitive data, toinject malicious statements into form field.
10. Write programs that will defend against the SQLi attacks given in the previous exercise.
11. Write queries to insert encrypted data into the database and to retrieve the data using decryption.

TOTAL LECTURE HOURS:45 HOURS

Course Code	Course Title	L	T	P	J	C
22CYP302	DATA STRUCTURES AND ALGORITHMS LABORATORY	0	0	3	0	2
		Syllabus version			v.1.0	

COURSEOBJECTIVES:

1. To implement ADTs in Python.
2. To design and implement linear data structures – lists, stacks, and queues.
3. To implement sorting, searching and hashing algorithms.
4. To solve problems using tree and graph structures

COURSEOUTCOME:

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

1. Implement ADTs as Python classes.
2. Design, implement, and analyse linear data structures, such as lists, queues, andstacks, according to the needs of different applications.
3. Design, implement, and analyse efficient tree structures to meet requirementssuch as searching, indexing, and sorting.
4. Model problems as graph problems and implement efficient graph algorithms tosolve them

PRACTICAL EXERCISES:

1. Implement simple ADTs as Python classes
2. Implement recursive algorithms in Python
3. Implement List ADT using Python arrays
4. Linked list implementations of List
5. Implementation of Stack and Queue ADTs
6. Applications of List, Stack and Queue ADTs
7. Implementation of sorting and searching algorithms
8. Implementation of Hash tables
9. Tree representation and traversal algorithms
10. Implementation of Binary Search Trees
11. Implementation of Heaps
12. Graph representation and Traversal algorithms
13. Implementation of single source shortest path algorithm
14. Implementation of minimum spanning tree algorithms

TOTALLECTUREHOURS:45HOURS

Course Code	Course Title	L	T	P	J	C
22EEP301	SOFT SKILLS	0	0	2	0	1
		Syllabus version			v.1.0	

COURSE OBJECTIVES:

1. Do self-introspection and develop right attitude
2. Understand the self-motivation and mange his abilities with time
3. Understand the interpersonal skills
4. Know the leader's qualities and develop as a leader.
5. Understand the conflict at work and make right decisions

COURSE OUTCOME:

1. Able to develop self-confidence through right attitude
2. Use self-motivation and to manage his abilities.
3. Effectively use interpersonal skills.
4. Develop leadership qualities.
5. Able to make right decisions and solving conflicts

UNIT-1	SELF ANALYSIS	6 HOURS

Introduction,SWOTanalysis,self-introspection,selfconfidenceandself-esteem,Creativity-Outofthebox thinking, Creative thinking and Lateral thinking, Factors influencing attitude, Influence of attitude on behaviour, Synergy between knowledge, skill and attitude,

UNIT-2	GROWTH FACTORS	6 HOURS

Motivation, Motivational factors, Self-motivation, Intrinsic and extrinsic motivators, Goal setting,SMART goals, Short, long, life time goals, Time management, Value of time, Test your Time management skill, Prioritizing work, Time management matrix

UNIT-3	INTERPERSONAL SKILLS	6 HOURS

Gratitude, Secret of happiness, Understanding the integration of leadership, networking and teamwork, situation analysis, Importance of teamwork, Teamwork activity, Stress Management-Causes of stress and its impact, how to manage and de-stress

UNIT-4	LEADERSHIP	6 HOURS

Skillsneededforagoodleader,Typesofleadershipstyle,Assessmentofleadershipskills,Wheelof leadership, Personal, social and professional etiquette Emotional intelligence, Emotional quotientand intelligence quotient, Emotion scale, Managing emotions

UNIT-5	CONFLICT RESOLUTION AND DECISION MAKING	6 HOURS

Conflicts in human relations, Self- assessment test for conflict management, Approaches to conflict resolution, Case study **Decision making-**Importance of decision making, Impact of decision in life, Process and practical way of decision making.

TOTAL LECTURE HOURS:30 HOURS

TEXT BOOK(S):

1	SOFTSKILLS,2015,CareerDevelopmentCentre,GreenPearlPublications

REFERENCE BOOKS:

1	Covey Sean, Seven HabitsofHighlyEffectiveTeens,NewYork,FiresidePublishers,1998
2	Carnegie Dale, How to Win Friends and Influence People, NewYork: Simon &Schuster, 1998.

SEMESTER IV

Course Code	Course Title	L	T	P	J	C
22BST401	DISCRETE MATHEMATICS	3	1	0	0	4
		Syllabus version			v. 1.0	

Course Objectives:

1. To extend student's logical and mathematical maturity and ability to deal withabstraction.
2. To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.
3. To understand the basic concepts of combinatorics and graph theory.
4. To familiarize the applications of algebraic structures.
5. To understand the concepts and significance of lattices and Boolean algebra which arewidely used in computer science and engineering.

Course Outcome:

1. Have knowledge of the concepts needed to test the logic of a program.
2. Have an understanding in identifying structures on many levels.
3. Be aware of a class of functions which transform a finite set into another finite set whichrelates to input and output functions in computer science.
4. Be aware of the counting principles.
5. Be exposed to concepts and properties of algebraic structures such as groups, rings andfields.

Unit-1	LOGIC AND PROOFS	12 hours

Propositional logic — Propositional equivalences - Predicates and quantifiers– Rules ofinference - Introduction to proofs

Unit-2	COMBINATORICS	12 hours

Mathematical induction – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Inclusion and exclusion principle and its applications.

Unit-3	GRAPHS	12 hours

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.

Unit-4	ALGEBRAIC STRUCTURES	12 hours

Algebraic systems – Semi groups and monoids - Groups – Subgroups – Homomorphism's – Co-sets – Lagrange's theorem

Unit-5	LATTICES AND BOOLEAN ALGEBRA	12 hours

Partial ordering — Po-sets — Lattices as posets — Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices — Boolean algebra

Total Lecture hours:	60 hours
TEXT BOOK(S)	
1.	Rosen. K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw HillPub. Co. Ltd., New Delhi, Special Indian Edition, 2017.
2.	Tremblay. J.P. and Manohar. R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.
REFERENCE BOOKS	
1.	Grimaldi. R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction",5thEdition, Pearson Education Asia, Delhi, 2013.
2.	Koshy. T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.
3.	Lipschutz. S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, TataMcGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.

Course Code	Course Title	L	T	P	J	C
22CST401	FOUNDATIONS OF DATA SCIENCE	3	0	0	0	3
		Syllabus version			v.1.0	

COURSE OBJECTIVES:

1. To understand the data science fundamentals and process.
2. To learn to describe the data for the data science process.
3. To learn to describe the relationship between data.
4. To utilize the Python libraries for Data Wrangling.
5. To present and interpret data using visualization libraries in Python

COURSE OUTCOME:

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

1. Define the data science process.
2. Understand different types of data description for data science process.
3. Gain knowledge on relationships between data.
4. Use the Python Libraries for Data Wrangling
5. Apply visualization Libraries in Python to interpret and explore data

UNIT-1	INTRODUCTION	9 HOURS

Data Science: Benefits and uses – facets of data - Data Science Process: Overview – Definingresearch goals – Retrieving data – Data preparation - Exploratory Data analysis – build the model– presenting findings and building applications - Data Mining - Data Warehousing —Basic Statistical descriptions of Data

UNIT-2	DESCRIBING DATA	9 HOURS

Types of Data - Types of Variables -Describing Data with Tables and Graphs –DescribingData with Averages - Describing Variability - Normal Distributions and Standard (z) Scores

UNIT-3	DESCRIBING RELATIONSHIPS	9 HOURS

Correlation –Scatter plots –correlation coefficient for quantitative data –computational formulafor correlation coefficient – Regression –regression line –least squares regression line – Standard error of estimate – interpretation of r2 –multiple regression equations –regression towards the mean

UNIT-4	PYTHON LIBRARIES FOR DATA WRANGLING	9 HOURS

Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – dataindexing and selection — operating on data — missing data — Hierarchical indexing — combining datasets – aggregation and grouping – pivot tables

UNIT-5	DATA VISUALIZATION	9 HOURS

Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn.

TOTAL LECTURE HOURS:45 HOURS

TEXT BOOK(S):	
1	David Cielen, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2016.
2	Robert S. Witte and John S. Witte, “Statistics”, Eleventh Edition, WileyPublications, 2017.
3	Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016.
REFERENCE BOOKS:	
1	Allen B. Downey, “Think Stats: Exploratory Data Analysis in Python”, Green TeaPress, 2014.

Course Code	Course Title	L	T	P	J	C
22CYT401	OPERATING SYSTEMS AND SECURITY	3	0	0	0	3
		Syllabus version			v.1.0	

COURSE OBJECTIVES:

1. To understand the basic concepts of Operating Systems.
2. To explore the process management concepts including scheduling, synchronization, threads and deadlock.
3. To understand the memory, file and I/O management activities of OS.
4. To understand the requirements of a trust model.
5. To learn how security is implemented in various operating systems.

COURSE OUTCOME:

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

1. To gain understanding on the concepts of Operating Systems.
2. To acquire knowledge on process management concepts including scheduling, synchronization threads and deadlock.
3. To have understanding on memory, file and I/O management activities of OS.
4. To understand security issues in operating systems and appreciate the need for securitymodels.
5. To gain exposure to the operating systems security models of WINDOWS and UNIX OS.

UNIT-1	OPERATING SYSTEM OVERVIEW	9 HOURS

Computer-System Organization – Architecture – Operating-System Operations – Resource Management – Security and Protection – Distributed Systems – Kernel Data Structures – Operating-System Services – System Calls – System Services – Why Applications Are Operating- System Specific – Operating-System Design and Implementation - Operating-System Structure – Building and Booting an Operating System .

UNIT-2	PROCESS MANAGEMENT	9 HOURS

Process Concept — Process Scheduling — Operation on Processes, Inter-process Communication – Threads – Overview – Multithreading models – Threading issues; CPU Scheduling – Scheduling criteria, Scheduling algorithms; Process Synchronization – critical- section problem, Synchronization hardware, Mutex locks, Semaphores, Critical regions, Monitors; Deadlock – System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Detection, Recovery.

UNIT-3	MEMORY MANAGEMENT AND FILE SYSTEMS	9 HOURS

Main Memory – Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation — Virtual Memory — Demand Paging, Page Replacement, Allocation, Thrashing; AllocatingKernel Memory. Mass Storage system - HDD Scheduling - File concept, Access methods,Directory Structure, Sharing and Protection; File System Structure, Directory implementation,Allocation Methods, Free Space Management

UNIT-4	SECURE SYSTEMS AND VERIFIABLE SECURITY GOALS	9 HOURS

Security Goals – Trust and Threat Model – Access Control Fundamentals – ProtectionSystem – Reference Monitor – Secure Operating System Definition – Assessment Criteria – Information Flow – Information Flow Secrecy Models – Denning's Lattice Model – Bell LaPadula Model – Information Flow Integrity Models – Biba Integrity Model – Low-WaterMark Integrity – Clark- Wilson Integrity

UNIT-5	SECURITY IN OPERATING SYSTEMS	9 HOURS
UNIX Security – UNIX Protection System – UNIX Authorization – UNIX Security Analysis – UNIX Vulnerabilities – Windows Security – Windows Protection System – Windows Authorization – Windows Security Analysis – Windows Vulnerabilities – Address Space Layout Randomizations – Retrofitting Security into a Commercial Operating System – Introduction to Security Kernels		
		TOTAL LECTURE HOURS:45 HOURS

TEXT BOOK(S):	
1	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating SystemConcepts", John Wiley & Sons, Inc., 10th Edition, 2021.
2	Trent Jaeger, Operating System Security, Morgan & Claypool Publishers series,2008
REFERENCE BOOKS:	
1	Morrie Gasser, "Building A Secure Computer System", Van Nostrand Reinhold, NewYork, 1988.
2	Charles Pfleeger, Shari Pfleeger, Jonathan Margulies, "Security in Computing", FifthEdition, Prentice Hall, New Delhi, 2015.
3	William Stallings, "Operating Systems – Internals and Design Principles", 9th Edition, Pearson, 2017.
4	Michael Palmer, "Guide to Operating Systems Security", Course Technology –Cengage Learning, New Delhi, 2008.
5	Introduction to Hardware, Security and Trust, book by Mohammad Tehranipoor, CliffWang, Springer, 2012.
6	Gary McGraw, Software Security: Building Security In, Addison Wesley software security series, 2005.

Course Code	Course Title	L	T	P	J	C
22CYT402	DISTRIBUTED SYSTEMS	3	0	0	0	3
		Syllabus version			v.1.0	

COURSE OBJECTIVES:

The student should be made to:

1. Understand foundations of Distributed Systems.
2. Introduce the idea of peer to peer services and file system.
3. Understand in detail the system level and support required for distributed system.
4. Understand the issues involved in studying process and resource management.

COURSE OUTCOME:

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

1. Discuss trends in Distributed Systems.
2. Apply network virtualization.
3. Apply remote method invocation and objects.
4. Design process and resource management systems.

UNIT-1	DISTRIBUTED SYSTEM BASICS	7 HOURS

Examples of Distributed Systems–Trends in Distributed Systems – Focus on resource sharing – Challenges. Case study: World Wide Web.

UNIT-2	COMMUNICATION IN DISTRIBUTED SYSTEM	10 HOURS

Network virtualization: Overlay networks. Case study: MPI Remote Method Invocation And Objects: Remote Invocation – Introduction - Request-reply protocols - Remote procedure call - Remote method invocation. Case study: Java RMI - Group communication - Publish-subscribe systems - Message queues - Shared memory approaches - Distributed objects - Case study: Enterprise Java Beans -from objects to components.

UNIT-3	DISTRIBUTED FILE SYSTEM	10 HOURS

Introduction - Napster and its legacy - Middleware - Routing overlays. Overlay case studies: Pastry, Tapestry- Distributed File Systems –Introduction - File service architecture – Andrew File system. File System: Features-File model -File accessing models - File sharing semantics Naming: Identifiers, Addresses, Name Resolution – Name Space Implementation – Name Caches – LDAP.

UNIT-4	SYNCHRONIZATION	9 HOURS

Introduction - Clocks, events and process states - Global states – Coordination and Agreement – Introduction - Distributed mutual exclusion – Elections – Transactions and Concurrency Control– Transactions -Nested transactions – Locks – Optimistic concurrency control - Timestamp ordering – Atomic Commit protocols -Distributed deadlocks – Replication – Case study – Coda.

UNIT-5	PROCESS MANAGEMENT	9 HOURS

Process Management: Process Migration: Features, Mechanism - Threads: Models, Issues, Implementation. Resource Management: Introduction- Features of Scheduling Algorithms –Task Assignment Approach – Load Balancing Approach – Load Sharing Approach.

TOTAL LECTURE HOURS:45 HOURS

TEXT BOOK(S):	
1	George Coulouris, Jean Dollimore and Tim Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education, 2012.
REFERENCE BOOKS:	
1	Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.
2	Tanenbaum A.S., Van Steen M., “Distributed Systems: Principles and Paradigms”, Pearson Education, 2007.
3	Liu M.L., “Distributed Computing, Principles and Applications”, Pearson Education, 2004.
4	Nancy A Lynch, “Distributed Algorithms”, Morgan Kaufman Publishers, USA, 2003.

Course Code	Course Title	L	T	P	J	C
22EST401	ENVIRONMENTAL SCIENCES ANDSUSTAINABILITY	2	0	0	0	2
		Syllabus version			v.1.0	
COURSE OBJECTIVES:						

1. To study the nature and facts about environment.
2. To finding and implementing scientific, technological, economic and political solutionsto environmental problems.
3. To study the interrelationship between living organism and environment.
4. To appreciate the importance of environment by assessing its impact on the humanworld; envision the surrounding environment, its functions and its value.
5. To study the dynamic processes and understand the features of the earth's interior and surface.
6. To study the integrated themes and biodiversity, natural resources, pollution control and waste management

COURSE OUTCOME:

1. Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge onthe following after completing the course.
2. Public awareness of environmental is at infant stage.
3.Ignoranceandincomplete knowledge has led to misconception
4.Developmentandimprovementinstd.oflivinghas lead to serious environmental disasters

UNIT-1	ENVIRONMENT, ECOSYSTEMS ANDBIODIVERSITY	6HOURS

Definition, scope and importance of environment — need for public awareness. Eco- system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wild life conflicts – endangered and endemic species of India – conservation of biodiversity:
In-situ and ex-situ.

UNIT-2	ENVIRONMENTAL POLLUTION	6HOURS

Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions.Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system(OHASMS).Environmental protection, Environmental protection acts

UNIT-3	NATURAL RESOURCES	6HOURS

Energy management and conservation, New Energy Sources: Need of new sources. Different Types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidalenergy conversion. Concept, origin and power plants of geothermal energy.

UNIT-4	SOCIAL ISSUES AND THE ENVIRONMENT	6HOURS

Development, GDP, Sustainability- concept, needs and challenges-economic, social andaspectsofsustainability-fromunsustainabilitytosustainability-millenniumdevelopmentgoals, and protocols- Sustainable Development Goals-targets, indicators and intervention areasClimate change-Global, Regional and local environmental issues and possible solutions-casestudies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-
A case study

UNIT-5	HUMAN POPULATION AND THE ENVIRONMENT	6HOURS
Population growth, variation among nations – population explosion–family welfare Programme — Environment and human health — human rights — value education — HIV /AIDS—women and child welfare — role of information technology in environment and human health– Casestudies.		
TOTAL LECTURE HOURS:30 HOURS		

TEXT BOOK(S):	
1	AnubhaKaushikandC.P.Kaushik's"PerspectivesinEnvironmentalStudies",6th Edition,New Age International Publishers ,2018.
2	Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, NewDelhi, 2016.
3	Gilbert M. Masters, 'Introduction to Environmental Engineering and Science', 2ndedition, Pearson Education, 2004.
REFERENCE BOOKS:	
1	Cunningham, W.P. Cooper, T.H. Gorhani,' Environmental Encyclopedia', Jaico Publ.,House, Mumbai,2001.
2	Erach Bharucha " Text book Orient of Environmental Studies for Undergraduate Courses" Black swan Pvt.Ltd.2013.

Course Code	Course Title	L	T	P	J	C
22CSP401	**DATA SCIENCE LABORATORY**	**0**	**0**	**3**	**0**	**1.5**
		Syllabus version		v.1.0		

COURSE OBJECTIVES:

1. To understand the python libraries for data science
2. To understand the basic Statistical and Probability measures for data science.
3. To learn descriptive analytics on the benchmark data sets.
4. To apply correlation and regression analytics on standard data sets.
5. To present and interpret data using visualization packages in Python.

COURSE OUTCOME:

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

1. Make use of the python libraries for data science
2. Make use of the basic Statistical and Probability measures for data science.
3. Perform descriptive analytics on the benchmark data sets.
4. Perform correlation and regression analytics on standard data sets.
5. Present and interpret data using visualization packages in Python.

PRACTICAL EXERCISES:

1. Download, install and explore the features of NumPy, SciPy, Jupyter, Statsmodels and Pandaspackages.
2. Working with Numpy arrays
3. Working with Pandas data frames
4. Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data set.
5. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following:
a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.
b. Bivariate analysis: Linear and logistic regression modeling
c. Multiple Regression analysis
d. Also compare the results of the above analysis for the two data sets.
6. Apply and explore various plotting functions on UCI data sets.
a. Normal curves
b. Density and contour plots
c. Correlation and scatter plots
d. Histograms
e. Three dimensional plotting
7. Visualizing Geographic Data with Basemap

TOTAL LECTURE HOURS:60 HOURS

Course Code	Course Title	L	T	P	J	C
22CYP401	**OPERATING SYSTEMS LABORATORY**	**0**	**0**	**3**	**0**	**1.5**
		Syllabus version			v.1.0	

COURSEOBJECTIVES:

1. To understand the basic concepts of Operating Systems.
2. To explore the process management concepts including scheduling, synchronization,threads and deadlock.
3. To understand the memory, file and I/O management activities of OS.
4. To understand the requirements of a trust model.
5. To learn how security is implemented in various operating systems.

COURSEOUTCOME:

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

1. To gain understanding on the concepts of Operating Systems.
2. To acquire knowledge on process management concepts including scheduling, synchronization threads and deadlock.
3. To have understanding on memory, file and I/O management activities of OS.
4. To understand security issues in operating systems and appreciate the need forsecurity models.
5. To gain exposure to the operating systems security models of WINDOWS andUNIX OS.

PRACTICAL EXERCISES:

1. Basics of UNIX commands, Understand and practice Linux permissions, special permissionsand authentication (various options of chmod, setuid, setgid)
2. Write programs using the following system calls of UNIX operating system

a. fork, exec, getpid, exit, wait, close, stat, opendir, readdir

3. Write C programs to implement the various CPU Scheduling Algorithms
4. Implementation of Semaphores
5. Implementation of Shared memory
6. Bankers Algorithm for Deadlock Detection &Avoidance
7. Implementation of the following Memory Allocation Methods for fixed partition

a) First Fit b) Worst Fit c) Best Fit

8. Implementation of the following Page Replacement Algorithms

a) FIFO b) LRU c) LFU

9. Program to demonstrate the working of Bell LaPadula Model and Biba Integrity Model
10. Setting up access control lists of files and directories and testing the lists in Linux
11. Learn to enable and disable address space layout randomization

TOTAL LECTURE HOURS: 60 HOURS

Course Code	Course Title	L	T	P	J	C
22EEP401	**QUANTITATIVE ANALYSIS AND LOGICALREASONING - 1**	**0**	**0**	**2**	**0**	**1**
		Syllabus version			v.1.0	

COURSE OBJECTIVES:

This module would train the students on the quick ways to solve quantitative aptitude problems and questions applying logical reasoning, with in a short time span given duringthe placement drives.

COURSE OUTCOME:

1. Mock interviews
2. Quantitative aptitude
3. Logical Reasoning

PRACTICAL EXERCISES:

1. Mock interviews on one-on-one basis
2. Quantitative aptitude
3. Partnership
4. Simple Interest, Compound Interest
5. Profit and Loss
6. Problems on Clock, Calendar and Cubes
7. Permutation and Combination
8. Allegation and mixtures
9. Logical Reasoning
10. Letter and Symbol series
11. Number series
12. Analyzing arguments
13. Making judgments

TOTAL LECTURE HOURS:60 HOURS