J.N.N INSTITUTE OF ENGINEERING

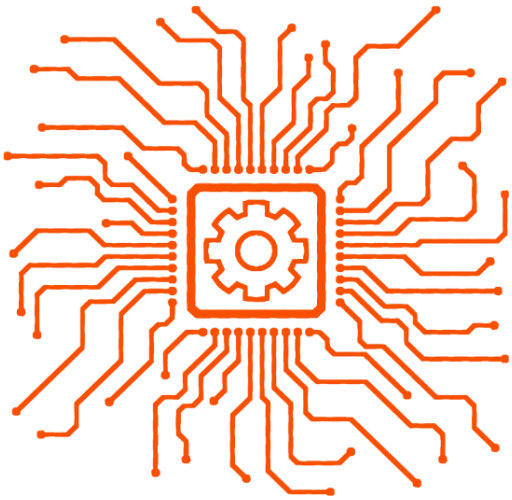
AUTONOMOUS

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

ACADEMIC CURRICULUM
(REGULATION 2022)
FOR

UNDER GRADUATE PROGRAMMES
CHOICE BASED CREDIT SYSTEM
(Applicable to the students admitted from the Academic Year 2023 – 2024 onwards)

B. E – ELECTRONCIS ENGINEERING (VLSI DESIGN AND TECHNOLOGY)



B. E – ELECTRONCIS ENGINEERING (VLSI DESIGN AND TECHNOLOGY)

ABOUT THE DEPARTMENT

The Department of Electronics Engineering (VLSI Design and Technology), was established in the year 2023 with an intake of 60, is a four-year program to provide engineering graduates with comprehensive knowledge about integrated circuit designs, which is usually known as chip design. The program emphasizes the key aspects of software and hardware design and development for VLSI applications. The course material is intended to provide students with an in-depth understanding of semiconductor devices, VLSI circuit design and verification, FPGA design, and the fabrication process, in addition to providing hands-on experience with leading EDA (Electronic Design and Automation) tools. The curriculum is designed to prepare students for future industry-specific requirements. In addition, students have the opportunity to pursue flexible course work, participate in industrial internships, work on real-world projects, and receive hands-on experience with the machinery and procedures used in the fabrication of integrated circuits. The students completing this course will be readily employable in the semiconductor chip designing and fabrication industry.

VISION

The Department of Electronics and communication engineering supports the mission of the College by providing programs of the highest quality to produce world class engineers through teaching, research and service who can address challenges of the millennium and to be recognized by the society at large as an excellent department.

MISSION

MISSION 1: To provide an environment that encourages the graduates to excel in the field of VLSI design and verification with the best of their abilities.

MISSION 2: To create an academic eco-system that encourages the students towards start-up and entrepreneurship.

MISSION 3: To develop graduates who can perform research and transfer results into technology and products to meet the changing needs of the society.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO's)

Bachelor of Electronics Engineering curriculum is designed to prepare the graduates having attitude and knowledge to

PEO1: Identify and apply appropriate Electronic Design Automation (EDA) to solve real world problems in VLSI domain to create innovative products and systems.

PEO2: Develop managerial skill and apply appropriate approaches in the domain of VLSI design incorporating safety, sustainability and become a successful professional or an entrepreneur in the domain.

PEO3: Pursue career in research in VLSI design domain through self-learning and self-directed on cutting edge technologies

PEO4: To demonstrate self – management and teamwork in a collaborative and multidisciplinary arena

PROGRAMME OUTCOMES (POs)

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

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

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

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

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

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

PO 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.

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

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

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

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

PO 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.

PROGRAMME SPECIFIC OUTCOMES

PSO1: Acquire competency in areas of VLSI including IC Fabrication, Design, Testing, Verification and Integrate multiple sub-systems to develop System on Chip.

PSO2: Design, implement, analyse and interpretation of VLSI projects using CAD& EDA tools: Cadence-Spice, Xilinx ISE, MATLAB, Mentor graphics, micro wind, DSCH

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B.E ELECTRONICS ENGINEERING (VLSI DESIGN AND TECHNOLOGY)
CURRICULUM FOR SEMESTERS I TO VIII AND SYLLABI FOR SEMESTER I – IV
SEMESTER 1

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	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	Problem Solving and Python Programming	L	3	0	0	0	3	3	ESC
6	22HSM101	தமிழர் மரபு/ Heritage of Tamils	L	1	0	0	0	1	1	HSMC
EMPLOYABILITY ENHANCEMENT COURSE										
7	22EET101	Engineering and Professional Skills	L+P	1	0	2	0	3	2	EEC
PRACTICAL COURSES										
8	22ESP101	Problem Solving and Python Programming Laboratory	P	0	0	4	0	4	2	ESC
9	22BSP101	Physics and Chemistry Laboratory	P	0	0	4	0	4	2	BSC
EMPLOYABILITY ENHANCEMENT COURSE										
10	22EEP101	Product Tinkering Laboratory	P	0	0	2	0	2	1	EEC
			TOTAL	**16**	**02**	**16**	**00**	**34**	**25**	

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

SEMESTER II

S. No	COURSE CODE	COURSE TITLE	MODE	PERIODS PER WEEK				TCP	C	CAT
				L	T	P	J			
THEORY COURSES										
1		Language Elective	L+P	3	0	2	0	5	4	HSMC
2	22BST203	Transforms and Numerical methods	L	3	2	0	0	5	4	BSC
3	22VLT201	Analog Electronic Circuits	L	3	0	0	0	3	3	PCC
4	22EST203	Basics of Electrical Engineering and Circuits	L	3	0	0	0	3	3	ESC
5	22EST202	Engineering Graphics	L+P	1	0	4	0	5	3	ESC
6	22HSM201	தமிழரும் தொழில் நுட்பமும் / Tamils and Technology	L	1	0	0	0	1	1	HSMC
EMPLOYABILITY ENHANCEMENT COURSE										
7	22EET201	Innovation and Design Thinking*	L	2	0	0	0	2	2	EEC
MANDATORY COURSE										
8	22NXP201	NCC/NSS/YRC Credit Course Level – I #	-	1	0	0	0	1	1#	-
PRACTICAL COURSES										
9	22ESP201	Engineering Product Laboratory	P	0	0	3	0	3	1.5	ESC
10	22VLP201	Analog Electronic circuits Laboratory	P	0	0	3	0	3	1.5	PCC
			TOTAL	**17**	**02**	**12**	**00**	**31**	**23**	

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

 # NCC Credit Course level 1 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.
***Common for all branches**

SEMESTER III

S. No	COURSE CODE	COURSE TITLE	MODE	PERIODS PER WEEK				TCP	C	CAT
				L	T	P	J			
THEORY COURSES										
1	22BST302	Probability and Random Process	L	3	2	0	0	5	4	BSC
2	22EST401	Environmental Sciences and Sustainability	L	2	0	0	0	2	2	ESC
3	22VLT301	Signals and Systems	L	3	2	0	0	5	4	PCC
4	22ECT303	Digital Electronics	L	3	0	0	0	3	3	PCC
5	22VLT302	Introduction to VLSI	L	3	0	0	0	3	3	PCC
6	22HST301	Entrepreneurship and startups*	L	2	0	0	0	2	2	HSMC
PRACTICAL COURSES										
7	22VLP301	Signals and Systems Laboratory	P	0	0	3	0	3	1.5	PCC
8	22ECP302	Digital Electronics Laboratory	P	0	0	3	0	3	1.5	PCC
EMPLOYABILITY ENHANCEMENT COURSE										
9	22EEP301	Soft Skills*	P	0	0	2	0	2	1	EEC
			TOTAL	**16**	**4**	**8**	**0**	**28**	**22**	

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

*** Common to all branches**

SEMESTER IV

S.No	COURSE CODE	COURSE TITLE	MODE	PERIODS PER WEEK				TCP	C	CAT
				L	T	P	J			
THEORY COURSES										
1	22VLT401	Analog and Digital Communication	L	3	2	0	0	5	4	PCC
2	22ECT402	Linear Integrated Circuits and Applications	L	3	0	0	0	3	3	PCC
3	22VLT402	Digital Signal Processing	L+P	3	0	2	0	5	4	PCC
4	22VLT403	Introduction to Micro fabrication	L	3	0	0	0	3	3	PCC
5	22VLT404	Computer Architecture and Organization	L	3	0	0	0	3	3	PCC
MANDATORY COURSE										
6	22NXP401	NCC/NSS/YRC Credit Course Level-II #	-	1	0	0	0	1	1#	-
PRACTICAL COURSES										
7	22ECP401	Linear Integrated Circuits Laboratory	P	0	0	3	0	3	1.5	PCC
8	22VLP401	Analog and Digital Communication Laboratory	P	0	0	3	0	3	1.5	PCC
EMPLOYABILITY ENHANCEMENT COURSE										
9	22EEP401	Quantitative Analysis and Logical Reasoning – I *	P	0	0	2	0	2	1	EEC
			TOTAL	**16**	**2**	**10**	**0**	**28**	**21**	

L- Lecture T- Tutorial P- Practical J- Project TCP- Total Contact Periods
C- Credits CAT- Category
*** Common to all branches**
 # NCC Credit Course level II is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

SEMESTER V

S.No	COURSE CODE	COURSE TITLE	MODE	PERIODS PER WEEK				TCP	C	CAT
				L	T	P	J			
THEORY COURSES										
1	22VLT501	Microprocessors and Microcontrollers	L	3	0	0	0	3	3	PCC
2	22VLT502	Advanced Digital System Design with HDL	L	3	2	0	0	5	4	PCC
3		Management elective	L	3	0	0	0	3	3	HSMC
PROFESSIONAL ELECTIVE										
4		Professional Elective I	L	3	0	0	0	3	3	PEC
EMPLOYABILITY ENHANCEMENT COURSE										
5	22HST501	Engineering Economics and Financial Management*	L	3	0	0	0	3	3	HSMC
MANDATORY COURSE										
6		Mandatory Course - I	L	3	0	0	0	3	0	MCC
ENROLLMENT FOR B.E. / B. TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)										
7		Minor/ Honour/ Remedial class **	L	3	0	0	0	3	3**	PEC**
PRACTICAL COURSES										
8	22VLP501	Microprocessors and Microcontrollers Laboratory	P	0	0	3	0	3	1.5	PCC
9	22VLP502	Advanced Digital System Design with HDL Laboratory	P	0	0	3	0	3	1.5	PCC
EMPLOYABILITY ENHANCEMENT COURSE-										
10	22EEP501	Internship*	P	0	0	0	0	0	1	EEC
			TOTAL	**21**	**2**	**6**	**0**	**29**	**20**	

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**

SEMESTER VI

S.No	COURSE CODE	COURSE TITLE	MODE	PERIODS PER WEEK				TCP	C	CAT
				L	T	P	J			
THEORY COURSES										
1	22VLT601	Static Timing Analysis	L	3	0	0	0	3	3	PCC
2	22VLT602	CAD for VLSI	L+P	3	0	2	0	5	4	PCC
3	22VLT603	Design for Testability	L	3	0	0	0	3	3	PCC
OPEN ELECTIVE										
4		Open Elective-I	L	3	0	0	0	3	3	OEC
PROFESSIONAL ELECTIVE										
5		Professional Elective - II	L	3	0	0	0	3	3	PEC
6		Professional Elective - III	L	3	0	0	0	3	3	PEC
MANDATORY COURSE										
7		Mandatory Course - II	L	3	0	0	0	3	0	MCC
8	22NXP601	NCC/NSS/YRC Credit Course Level- III #	-	1	0	0	0	1	1#	-
ENROLLMENT FOR B.E. / B.TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)										
9		Minor/Honour/remedial class**		3	0	0	0	3	3**	PEC**
PRACTICAL COURSES - EMPLOYABILITY ENHANCEMENT COURSE										
10	22EEP601	Quantitative Analysis and Logical Reasoning – II *	P	0	0	2	0	2	1	EEC
11	22EEP602	Comprehensive Assessment*		0	0	2	0	2	1	EEC
PRACTICAL COURSES										
12	22VLP601	Static Timing Analysis & Design for Testability Laboratory	P	0	0	4	0	4	2	PCC
			TOTAL	**25**	**0**	**10**	**0**	**35**	**23**	

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**

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

SEMESTER VII

S.No	COURSE CODE	COURSE TITLE	MODE	PERIODS PER WEEK				TCP	C	CAT
				L	T	P	J			
THEORY COURSES										
1	22VLT701	Low Power VLSI Design	L	3	2	0	0	5	4	PCC
OPEN ELECTIVE										
2		Open Elective-II	L	3	0	0	0	3	3	OEC
PROFESSIONAL ELECTIVE										
3		Professional Elective – IV	L	3	0	0	0	3	3	PEC
4		Professional Elective – V	L	3	0	0	0	3	3	PEC
5		Professional Elective – VI	L	3	0	0	0	3	3	PEC
ENROLLMENT FOR B.E. / B.TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)										
6		Minor/ Honour/ Remedial class **	L	3	0	0	0	3	3**	PEC**
PRACTICAL COURSES										
7	22VLJ701	Mini Project	J	0	0	0	2	2	1	EEC
PRACTICAL COURSES - EMPLOYABILITY ENHANCEMENT COURSE										
8	22EEP701	Product Design and Development *	P	0	0	0	4	4	2	EEC
9	22EEP702	Internship *	P	0	0	0	0	0	1	EEC
			TOTAL	**18**	**2**	**0**	**6**	**26**	**20**	

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**

SEMESTER VIII

S.No	COURSE CODE	COURSE TITLE	MODE	PERIODS PER WEEK				TCP	C	CAT
				L	T	P	J			
PRACTICAL COURSES - EMPLOYABILITY ENHANCEMENT COURSE										
1	22VLJ801	Project Work	J	0	0	0	16	16	8	EEC
ENROLLMENT FOR B.E. / B.TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)										
2		Minor/Honour/remedial class **	L	3	0	0	0	3	3**	PEC**
			TOTAL	**03**	**00**	**00**	**16**	**19**	**8**	

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**

CREDIT DISTRIBUTION

Semester	HSMC	BSC	ESC	PCC	PEC	OEC	EEC	MC	TOTAL	Total PER %
I	5	12	5				3		25	15.5
II	5	4	7.5	4.5			2		23	14
III	2	4	2	13			1		22	13.5
IV				20			1		21	13
V	6			10	3		1		20	12.5
VI				12	6	3	2		23	14
VII				4	9	3	4		20	12.5
VIII							8		8	5
TOTAL	18	20	14.5	63.5	18	6	22		162	100

CATEGORY		Breakup of Credits	PER % in Total
HSMC	Humanities & Social Science Including Management	18	11
BSC	Basic Science Courses	20	12
ESC	Engineering Science Courses	14.5	9
PCC	Professional Core Courses	63.5	40
PEC	Professional Elective Courses	18	11
OEC	Open Elective Courses	6	4
EEC	Employment Enhancement Courses	22	13
MCC	Mandatory Courses	-	-
	Total Credits	162	100

PROFESSIONAL ELECTIVES COURSES: VERTICALS

VERTICAL I	VERTICAL II	VERTICAL III	VERTICAL IV	VERTICAL V	VERTICAL VI
Semiconductor Chip Design and Testing	**Multicore Implementation**	**Signal/Image Processing**	**RF Technologies**	**Embedded and IoT**	**Artificial Intelligence and Machine Learning**
Solid state Device Modelling	Multicore Architecture and Programming	VLSI Signal Processing	RF Transceivers	Distributed Embedded Computing	Soft Computing
RTL Synthesis	ASIC Design	Adaptive Signal Processing Techniques	RF System Design	Real Time Operating Systems	Concepts in Artificial Intelligence
Validation and Testing Technology	Physical design	Image Processing	Signal Integrity for high Speed Design	Hardware and Software Co Design	Computational Intelligence
CMOS Digital Integrated Circuits	Power Management and Clock Distribution Circuits	Image Analysis and Computer Vision	EMI and EMC in System Design	Embedded Automotive systems	Artificial Intelligence and Machine Learning
Mixed Signal IC Design Testing	System on Chip	Pattern Recognition and Machine Learning	RF IC Design	SoC Design for Embedded System	Artificial Intelligence and Robotics
Design verification methodologies	Network on Chip	FPGA	RF ID System Design and Testing	Industrial IoT and Industry 4.0	Drones and Autonomous Systems

Registration of Professional Elective Courses from Verticals:

Professional Elective Courses will be registered in Semesters V and VI. These courses are listed in groups called verticals that represent a particular area of specialization / diversified group. Students are permitted to choose all the Professional Electives from a particular vertical or from different verticals. Further, only one Professional Elective course shall be chosen in a semester horizontally (row-wise). However, two courses are permitted from the same row, provided one course is enrolled in Semester V and another in semester VI. The registration of courses for B.E./B.Tech (Honours) or Minor degree shall be done from Semester V to VIII. The procedure for registration of courses explained above shall be followed for the courses of B.E/B.Tech (Honours) or Minor degree also. For more details on B.E./B.Tech (Honours) or Minor degree refer to the Regulation.

VERTICAL I Semiconductor Chip Design and Testing								
S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**J**	**Contact Hours**	**Credits**
1	22VLPE01	Solid state Device Modelling	3	0	0	0	3	3
2	22VLPE02	RTL Synthesis	3	0	0	0	3	3
3	22VLPE03	Validation and Testing Technology	3	0	0	0	3	3
4	22VLPE04	CMOS Digital Integrated Circuits	3	0	0	0	3	3
5	22VLPE05	Mixed Signal IC Design Testing	3	0	0	0	3	3
6	22VLPE06	Design verification methodologies	3	0	0	0	3	3

VERTICAL II Multicore Implementation								
S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**J**	**Contact Hours**	**Credits**
1	22VLPE07	Multicore Architecture and Programming	3	0	0	0	3	3
2	22VLPE08	ASIC Design	3	0	0	0	3	3
3	22VLPE09	Physical design	3	0	0	0	3	3
4	22VLPE10	Power Management and Clock Distribution Circuits	3	0	0	0	3	3
5	22VLPE11	System on Chip	3	0	0	0	3	3
6	22VLPE12	Network on Chip	3	0	0	0	3	3

VERTICAL III Signal / Image Processing								
S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**J**	**Contact Hours**	**Credits**
1	22VLPE13	VLSI Signal Processing	3	0	0	0	3	3
2	22VLPE14	Adaptive Signal Processing Techniques	3	0	0	0	3	3
3	22VLPE15	Image Processing	3	0	0	0	3	3
4	22VLPE16	Image Analysis and Computer Vision	3	0	0	0	3	3
5	22VLPE17	Pattern Recognition and Machine Learning	3	0	0	0	3	3
6	22VLPE18	FPGA	3	0	0	0	3	3

VERTICAL IV RF Technologies								
S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**J**	**Contact Hours**	**Credits**
1	22VLPE19	RF Transceivers	3	0	0	0	3	3
2	22VLPE20	RF System Design	3	0	0	0	3	3
3	22VLPE21	Signal Integrity for high Speed Design	3	0	0	0	3	3
4	22VLPE22	EMI and EMC in System Design	3	0	0	0	3	3
5	22VLPE23	RF IC Design	3	0	0	0	3	3
6	22VLPE24	RF ID System Design and Testing	3	0	0	0	3	3

VERTICAL V Embedded and IoT								
S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**J**	**Contact Hours**	**Credits**
1	22VLPE25	Distributed Embedded Computing	3	0	0	0	3	3
2	22VLPE26	Real Time Operating Systems	3	0	0	0	3	3
3	22VLPE27	Hardware and Software Co Design	3	0	0	0	3	3
4	22VLPE28	Embedded Automotive systems	3	0	0	0	3	3
5	22VLPE29	SoC Design for Embedded System	3	0	0	0	3	3
6	22VLPE30	Industrial IoT and Industry 4.0	3	0	0	0	3	3

VERTICAL VI Artificial Intelligence and Machine Learning								
S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**J**	**Contact Hours**	**Credits**
1	22VLPE31	Soft Computing	3	0	0	0	3	3
2	22VLPE32	Concepts in Artificial Intelligence	3	0	0	0	3	3
3	22VLPE33	Computational Intelligence	3	0	0	0	3	3
4	22VLPE34	Artificial Intelligence and Machine Learning	3	0	0	0	3	3
5	22VLPE35	Artificial Intelligence and Robotics	3	0	0	0	3	3
6	22VLPE36	Drones and Autonomous Systems	3	0	0	0	3	3

ELECTIVE – MANAGEMENT (Semester V)								
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**J**	**Contact Hours**	**Credits**
1	22ECPE37	Marketing Management	3	0	0	0	3	3
2	22ECPE38	Total Quality Management	3	0	0	0	3	3
3	22ECPE39	Entrepreneurship Development	3	0	0	0	3	3
4	22ECPE40	Project Management	3	0	0	0	3	3
5	22ECPE41	Principles of Management	3	0	0	0	3	3

MANDATORY COURSE I								
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 COURSE II								
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 (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 similar to 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	3	0	0	0	3	3
8	22ADO002	Software Testing	3	0	0	0	3	3
9	22ADO003	Principles of Programming Language	3	0	0	0	3	3
10	22ADO004	Digital Marketing	3	0	0	0	3	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	3	0	0	0	3	3
8	22ADO006	Cloud Computing	3	0	0	0	3	3
9	22ADO007	Cloud Service Management	3	0	0	0	3	3
10	22ADO008	Operating System	3	0	0	0	3	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

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 **Gramma**r – 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.	Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House.

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
7. Listening to podcasts, anecdotes/event narration
8. Narrating personal experiences/ events
9. Listening to celebrity interviews
10. Conversation Skills- Politeness strategies
11. Listening to process descriptions
12. Describing a process
13. Listening to travelogues
14. Narrating travel experiences
15. Listening to educational videos
16. Group discussion
17. Listening to TED Talks
18. Mini Presentations
19. Listening to description of art work
20. Picture description
21. Listening to scientific lectures
22. Summarizing a lecture
23. Listening to definitions/ descriptions of objects
24. One minute speech - Describing an object
25. Listening to Tv shows
26. Anchoring a reality show
27. Listening to advertisements
28. Adzap
29. Listening to autobiography
30. Visume
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 familiarize the students with differential calculus.
3. To familiarize the student with functions of several variables. This is needed in many branches of engineering.
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 - Techniques of Integration: Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals - Applications: Hydrostatic force and pressure, moments and centres of mass.

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 – Change of variables in double and triple integrals – Applications : Moments and centres of mass, moment

of inertia.	
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**
		Syllabus version			**v. 1.0**	

COURSE OBJECTIVES:

After studying this course, you should be able to:

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

1. Understand the importance of mechanics.
2. Express their knowledge in electromagnetic waves.
3. Demonstrate a strong foundational knowledge in oscillations, optics and lasers.
4. Understand the importance of quantum physics.
5. Comprehend and apply quantum mechanical principles towards the formation of energy bands

UNIT-1	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-2	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-3	OSCILLATIONS, OPTICS AND LASERS	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-4	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-5	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.
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**
		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 nanomaterials.
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 storage devices and computational chemistry that are essential for chemistry.

COURSE OUTCOME:

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

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 nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
3. To analyse 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 solve chemical problems by simulating chemical systems (molecular, biological, materials) in order to provide reliable, accurate and comprehensive information at an atomic level.

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. CO2 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: H2-O2 fuel cell, microbial fuel cell; Supercapacitors: 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:

After studying this course, you should be able to:

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, building blocks 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", 2nd Edition, 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.
5.	Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.

Course Code	Course Title	L	T	P	J	C
22HSM101	**தமிழர் மரபு/ HERITAGE OF TAMILS**	**1**	**0**	**0**	**0**	**1**
Pre-requisite		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 in 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 to enhance 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 features offered
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:

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

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 content for their day to day technical and academic requirements
4. Use MS EXCEL to perform data operations and analytics, record, retrieve data as per 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 media objects.

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 with styles, 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, Working with 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 tables to summarize and analyse 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 and numbering, 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, 1 stEdition,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 Environmental Engineering, 3rd Edition, John Wiley & Sons, Inc,	

Course Code	Course Title	L	T	P	J	C
22ESP101	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY	0	0	4	0	2
		Syllabus version			v. 1.0	
COURSE OBJECTIVES:						
After studying this course, you should be able to: 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. Deploy functions to decompose a Python program.
4. Process compound data using Python data structures.
5. 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 values of 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)
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy. Matplotlib, scipy)
9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
10. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity, student mark range validation)
11. Exploring Pygame tool.
12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL LECTURE HOURS:	**60 HOURS**

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

PHYSICS LABORATORY
(Any Seven Experiments)

COURSE OBJECTIVES:

After studying this course, you should be able to:

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:

Upon completion of the course, the students should be able to

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

LIST OF 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 LECTURE HOURS:	**30 HOURS**

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

CHEMISTRY LABORATORY

(Any seven experiments to be conducted)

COURSE OBJECTIVES:

After studying this course, you should be able to:

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:

Upon completion of the course, the students should be able to

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:

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 Lecture hours:	**30 HOURS**

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:

After studying this course, you should be able to:

1. Hands on practical training, maintenance and troubleshooting on mechanical and electrical appliances in day-to-day life.
2. Analyze 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:

Upon completion of the course, the students should be able to

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
22BST203	TRANSFORMS AND NUMERICAL METHODS	3	2	0	0	4
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

After studying this course, you should be able to:

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 introduce the basic concepts of solving algebraic and transcendental equations.
4. To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
5. To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

COURSE OUTCOME:

Upon completion of the course, the students should be able to

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. Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.
4. Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
5. Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

UNIT-1	FOURIER SERIES	9+3 HOURS
Dirichlet's conditions — General Fourier series — Odd and even functions — Half range sine series — Half range cosine series — Parseval's identity — Harmonic analysis.		
UNIT-2	**FOURIER TRANSFORMS**	**9+3 HOURS**
Fourier transform pair — Fourier sine and cosine transforms — Properties — Transforms of simple functions — Convolution theorem – Parseval's identity.		
UNIT-3	**Z — TRANSFORMS**	**9+3 HOURS**
Z-transforms — Elementary properties — Inverse Z-transform (using partial fraction and residues)— Convolution theorem.		
UNIT-4	**INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION**	**9+3 HOURS**
Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules.		
UNIT-5	**NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS**	**9+3 HOURS**
Taylor's series method - Modified Euler's method - Fourth order Runge - Kutta method for solving first order differential equations - Milne's forth predictor corrector methods for solving first order differential equations.		
	Total Lecture hours:	**60 HOURS**

TEXT BOOK(S)

1.	Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 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 "Advanced Mathematics for Engineering Students", Vol. II & III, S. Viswanathan Publishers Pvt. Ltd, Chennai, 1998.

REFERENCE BOOKS

1.	Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 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.	Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7th Edition, 2007.
4.	Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.

5.	Jain. R.K. and Iyengar. S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2016.
6.	Anton. H, Bivens. I and Davis. S, " Calculus ", Wiley, 10th Edition, 2016

Course Code	Course Title	L	T	P	J	C
22VLT201	ANALOG ELCTRONIC CIRCUITS	3	0	0	0	3
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

After studying this course, you should be able to:

1. To understand the structure of basic electronic devices.
2. To be exposed to active and passive circuit elements.
3. To familiarize the operation and applications of transistor like BJT and FET.
4. To explore the characteristics of amplifier, gain and frequency response.
5. To learn the required functionality of positive and negative feedback systems.

COURSE OUTCOME:

Upon completion of the course, the students should be able to

1. Explain the structure and operation of PN junction devices (diode, Zener diode, LED and Laser diode)
2. Design clipper, clamper, half wave and full wave rectifier, regulator circuits using PN junction diodes
3. Analyze the structure and characteristics BJT, FET, MOSFET, UJT, Thyristor and IGBT
4. Analyze the performance of various configurations of BJT and MOSFET based amplifier
5. Explain the characteristics of MOS based cascade and differential amplifier
6. Explain the operation of various feedback amplifiers and oscillators

UNIT-1	PN JUNCTION DEVICES	9 HOURS

PN junction diode –structure, operation and V-I characteristics, diffusion and transition capacitance – Clipping & Clamping circuits - Rectifiers – Half Wave and Full Wave Rectifier– Display devices- LED, Laser diodes, Zener diode characteristics- Zener diode Reverse characteristics – Zener diode as regulator.

UNIT-2	TRANSISTORS AND THYRISTORS	9 HOURS

BJT, JFET, MOSFET- structure, operation, characteristics and Biasing UJT, Thyristors and IGBT - Structure and characteristics

UNIT-3	AMPLIFIERS	9 HOURS

BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response –MOSFET small signal model– Analysis of CS and Source follower – Gain and frequency response- High frequency analysis.

UNIT-4	**MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER**	**9 HOURS**
BIMOS cascade amplifier, Differential amplifier – Common mode and Difference mode analysis – FET input stages – Single tuned amplifiers – Gain and frequency response – Neutralization methods, power amplifiers –Types (Qualitative analysis).		
UNIT-5	**FEEDBACK AMPLIFIERS AND OSCILLATORS**	**9 HOURS**
Advantages of negative feedback – voltage / current, series, Shunt feedback –positive feedback – Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.		
	Total Lecture hours:	**45 HOURS**

TEXT BOOK(S)

1.	David A. Bell , "Electronic devices and circuits", Oxford University higher education, 5th edition 2008.
2.	Sedra and smith, "Microelectronic circuits",7th Edition., Oxford University Press, 2017

REFERENCE BOOKS

1.	Balbir Kumar, Shail.B.Jain, "Electronic devices and circuits" PHI learning private limited, 2nd edition 2014
2.	Thomas L.Floyd, "Electronic devices" Conventional current version, Pearson prentice hall, 10th Edition, 2017.
3.	Donald A Neamen, "Electronic Circuit Analysis and Design" Tata McGraw Hill, 3rd Edition, 2003.
4.	Robert L.Boylestad, "Electronic devices and circuit theory", 11th edition, Pearson prentice Hall 2013.
5.	Robert B. Northrop, "Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation", CRC Press, Second edition, 2012.

Course Code	Course Title	L	T	P	J	C
22EST203	**BASICS OF ELECTRICAL ENGINEERING AND CIRCUITS**	**3**	**0**	**0**	**0**	**3**
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

After studying this course, you should be able to:

1. To develop an understanding of the fundamental laws, theorems, elements of electric circuits and to analyze dc and ac circuits
2. To understand transient response behaviour of electric circuits.
3. To introduce different methods of circuit analysis using network theorems, duality and topology

COURSE OUTCOME:

Upon completion of the course, the students should be able to 1. Apply the circuit theorems in real time 2. Analyze resonance and coupled circuits 3. Analyze the transient response for DC circuits 4. Explain the two port networks and parameters 5. Design, understand and evaluate the AC and DC circuits.		
UNIT-1	**FUNDAMENTALS OF ELECTRICAL ENGINEERING**	**9 hours**
Fundamental concepts of dc and ac circuits, Steady state solution of DC circuits, Circuit laws and their applications in solving problems Introduction to AC Circuits, Sinusoidal steady state analysis, Power and Power factor, Single phase and three phase balanced circuits.		
UNIT-2	**NETWORK THEOREMS FOR DC AND AC CIRCUITS**	**9 hours**
Source transformation, Superposition theorem, Thevenin's & Norton's theorems, Reciprocity and Maximum power transfer theorem, Application of Network theorems - Network reduction: voltage and current division, source transformation – star delta conversion.		
UNIT-3	**RESONANCE AND COUPLED CIRCUITS**	**9 hours**
Resonance - Series resonance - Parallel resonance, Variation of impedance with frequency - Variation in current through and voltage across L and C with frequency, Bandwidth - Q factor – Selectivity, Self-inductance - Mutual inductance - Dot rule - Coefficient of coupling - Analysis of multi winding coupled circuits, Series, parallel connection of coupled inductors - Single tuned and double tuned coupled circuits		
UNIT-4	**TRANSIENT ANALYSIS**	**9 hours**
Natural response - Forced response Transient response of RC, RL and RLC circuits to excitation by step signal, impulse signal and exponential sources Complete response of RC, RL and RLC circuits to sinusoidal excitation.		
UNIT-5	**TWO PORT NETWORKS**	**9 hours**
Two port networks, Z parameters, Y parameters, Transmission (ABCD) parameters, Hybrid(H) parameters Interconnection of two port networks		
	Total Lecture hours:	**45 hours**
TEXT BOOK(S)		
1.	Charles K. Alexander, Matthew N. O. Sadiku, Fundamentals of Electric Circuits, 2017, Sixth Edition, Tata McGraw Hill Education Private Limited, India.	
2.	Abhijit Chakrabarti, Circuit Theory Analysis and Synthesis, 2018, Seventh Edition, Dhanpat Rai and Co.	
REFERENCE BOOKS		
1.	Joseph Edminister and Mahmood Nahvi, "Electric Circuits", Schaum's Outline Series, Tata McGraw Hill Publishing Company, New Delhi, Fifth Edition Reprint 2016.	
2.	Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", 5th Edition, McGraw Hill, 9th Reprint, 2015.	

3.	Allan H.Robbins, Wilhelm C.Miller, “Circuit Analysis Theory and Practice”, Cengage Learning, 5th Edition, 1st Indian Reprint, 2013.

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

COURSE OBJECTIVES:

After studying this course, you should be able to:

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:

Upon completion of the course, the students should be able to

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, PROJECTIONOF POINTS AND LINES	3+9 HOURS

Conic Sections - Construction of Ellipse, Parabola & hyperbola by eccentricity method – Construction of cycloid. Introduction of Orthographic projection.
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, Cylinder& Cone when the axis is inclined to one of the principal planes by rotating object method.

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

Sectioning of simple solids (Prism, Pyramid, 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 (Only for Internal Evaluation)**	**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, 2nd Edition, 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	தமிழரும் தொழில் நுட்பமும் /TAMILS AND TECHNOLOGY	1	0	0	0	1
Pre-requisite		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:

After studying this course, you should be able to:

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

COURSE OUTCOME:

Upon completion of the course, the students should be able to

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

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 of ideas - 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 to conduct 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 to design thinking.	
2.	Designing for Growth: a design thinking tool kit for managers by Jeanne Liedtka and Tim Ogilvie.	
3.	Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation 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.	HassoPlattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2014.	
4.	Yousef Haik and Tamer M.Shahin, "Engineering Design Process", Cengage Learning, 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. 1.0	
COURSE OBJECTIVES:						
After studying this course, you should be able to: 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
22VLP201	**ANALOG ELECTRONIC CIRCUITS LABORATORY**	**0**	**0**	**3**	**0**	**1.5**
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

After studying this course, you should be able to:

1. Study the Frequency response of CE, CB and CC Amplifier
2. Learn the frequency response of CS Amplifiers
3. Study the Transfer characteristics of differential amplifier
4. Perform experiment to obtain the bandwidth of single stage and multistage amplifiers
5. Perform SPICE simulation of Electronic Circuits
6. Design and implement the Combinational and sequential logic circuits

COURSE OUTCOME:

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

1. Design and Test rectifiers, filters and regulated power supplies.
2. Design and Test BJT/JFET amplifiers.
3. Differentiate cascode and cascade amplifiers.
4. Analyze the limitation in bandwidth of single stage and multi stage amplifier
5. Measure CMRR in differential amplifier
6. Simulate and analyze amplifier circuits using PSpice.
7. Design and Test the digital logic circuits.

LIST OF EXPERIMENTS:

1.	Design of Regulated Power supplies
2.	Frequency Response of CE, CB, CC and CS amplifiers
3.	Darlington Amplifier
4.	Differential Amplifiers - Transfer characteristics, CMRR Measurement
5.	Cascode amplifiers
6.	Determination of bandwidth of single stage amplifiers
7.	Analysis of BJT with Fixed bias and Voltage divider bias using Spice
8.	Analysis of FET, MOSFET with fixed bias, self-bias and voltage divider bias using simulation software like Spice
9.	Analysis of Cascode amplifiers using Spice
10.	Analysis of Frequency Response of BJT and FET using Spice
TOTAL LABORATORY HOURS:	**45 HOURS**

LANGUAGE ELECTIVE

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

COURSE OBJECTIVES:

After studying this course, you should be able 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** – Paragraphs; Free writing & opinion paragraphs **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 social media messages **Writing** – Checklist; Letter to the editor **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** – Dialogue writing; Minutes of Meeting **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** – Recommendations; Job application **Grammar** – If conditional sentences, Articles **Vocabulary** - Purpose statements		
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, 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 Project 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

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

COURSE OBJECTIVES:

After studying this course, you should be able to:

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:

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

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, Pronomssujets 2. L'articledéfinis, l'articleindéfinis 3. Conjugation: présent, adjectifspossessifs 4. interrogation, décrire les personnes 5. La vie de quatreparisiens de professions différentes

UNIT-2	ELEMENTS OF GRAMMAR:	12 HOURS

1. Exprimerl'ordre et l'obligation demander et commander 51
2. l'adjectifpossessifs, l"articlepartitif, l'articledémonstratif, négation ne
3. pas, l'articlecontracté 4. verbepronominaux 5. prepositions

UNIT-3	SENTENCE STRUCTURE:	12 HOURS

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

UNIT-4	TENSES AND NUMBERS	12 HOURS

1. Demander l'autorisation-passé récent, futurproche
2. La vie administrative et régionale, Pluriel des noms, moyens de transport

UNIT-5	DISCOURSE	12 HOURS

1. le discoursrapporté, décrire un lieu, exprimersespréférences 2. décrire la carrière, discuterd "systèmeéducation de France 3. parler de la technologie de l"information

Total Lecture hours:	45 hours

TEXT BOOK(S)

1.	Christine Andantétal "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:

After studying this course, you should be able to:

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:

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

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 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	GUTEN TAG!	10 HOURS

1. To greet, learn numbers till 20, practice telephone numbers & e mail address, learn alphabet, 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 and frame simple questions & 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 dialogues and write short 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 & write invitations, 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", HueberVerlag., 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 alsFremdsprache)", Max HueberVerlag., 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:

After studying this course, you should be able to:

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:

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

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 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	JAPANESE PEOPLE AND CULTURE	12 HOURS

1. Basic greetings and responses 2. Basic script–Method of writing hiragana and katakana –Combination sounds and simple words 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 and pasttense) 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 some one out over the phone-Verbs denoting presence 3. Introduction to Adjectives (na and ii type) -Verb groups – I, II and III – Exercises to group verbs- Please do (tekudasai) 4. Present continuous tenses (teimasu) – Shall I? (~ mashouka) – 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 (gahoshii) –Wanting to…(Tabetidesu)- Going for a certain purpose (mi –niikimasu) 2. Choosing from a menu-Adjectives (“i” and “na” type) – Adjectives (Positive and negative useage)		
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.	EriBanno et.al "Genki I: An Integrated Course in Elementary Japanese I -Workbook", ., 1999	
2.	Tae Kim "A Guide to Japanese Grammar: A Japanese Approach to Learning Japanese Grammar", 2014	
3.	Minna No Nihongo "Translation & Grammatical Notes In English Elementary",	

COURSE CODE	COURSE TITLE	L	T	P	J	C
22NXP201	NCC Credit Course Level 1*	1	0	0	0	1

	(ARMY WING)	**Syllabus version**	**v. 1.0**

UNIT-1	**NCC GENERAL**	**3 HOURS**
NCC 1 Aims, Objectives & Organization of NCC NCC 2 Incentives NCC 3 Duties of NCC Cadet NCC 4 NCC Camps: Types & Conduct		
UNIT-2	**NATIONAL INTEGRATION AND AWARENESS**	**3 HOURS**
NI 1 National Integration: Importance & Necessity NI 2 Factors Affecting National Integration NI 3 Unity in Diversity & Role of NCC in Nation Building NI 4 Threats to National Security		
UNIT-3	**PERSONALITY DEVELOPMENT**	**3 HOURS**
PD 1 Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving PD 2 Communication Skills PD 3 Group Discussion: Stress & Emotions		
UNIT-4	**LEADERSHIP**	**2 HOURS**
L 1 Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code L 2 Case Studies: Shivaji, Jhasi Ki Rani		
UNIT-5	**SOCIAL SERVICE AND COMMUNITY DEVELOPMENT**	**4 HOURS**
SS 1 Basics, Rural Development Programmes, NGOs, Contribution o Youth SS 2 Protection of Children and Women Safety SS 3 Road / Rail Travel Safety SS 4 New Initiatives SS 5 Cyber and Mobile Security Awareness		
	TOTAL LECTURE HOURS	**15 HOURS**

COURSE CODE	**COURSE TITLE**	**L**	**T**	**P**	**J**	**C**
22NXP202	**NCC Credit Course Level 1* (NAVAL WING)**	**1**	**0**	**0**	**0**	**1**
		Syllabus version			**v. 1.0**	

UNIT-1	**NCC GENERAL**	**3 HOURS**
NCC 1 Aims, Objectives & Organization of NCC NCC 2 Incentives NCC 3 Duties of NCC Cadet NCC 4 NCC Camps: Types & Conduct		

UNIT-2	**NATIONAL INTEGRATION AND AWARENESS**	**3 HOURS**
NI 1 National Integration: Importance & Necessity NI 2 Factors Affecting National Integration NI 3 Unity in Diversity & Role of NCC in Nation Building NI 4 Threats to National Security		
UNIT-3	**PERSONALITY DEVELOPMENT**	**3 HOURS**
PD 1 Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving PD 2 Communication Skills PD 3 Group Discussion: Stress & Emotions		
UNIT-4	**LEADERSHIP**	**2 HOURS**
L 1 Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code L 2 Case Studies: Shivaji, Jhasi Ki Rani		
UNIT-5	**SOCIAL SERVICE AND COMMUNITY DEVELOPMENT**	**4 HOURS**
SS 1 Basics, Rural Development Programmes, NGOs, Contribution o Youth SS 2 Protection of Children and Women Safety SS 3 Road / Rail Travel Safety SS 4 New Initiatives SS 5 Cyber and Mobile Security Awareness		
	TOTAL LECTURE HOURS	**15 HOURS**

COURSE CODE	**COURSE TITLE**	**L**	**T**	**P**	**J**	**C**
22NXP203	**NCC Credit Course Level 1* (AIR FORCE WING)**	**1**	**0**	**0**	**0**	**1**
		Syllabus version			**v. 1.0**	

UNIT-1	**NCC GENERAL**	**3 HOURS**
NCC 1 Aims, Objectives & Organization of NCC NCC 2 Incentives NCC 3 Duties of NCC Cadet NCC 4 NCC Camps: Types & Conduct		
UNIT-2	**NATIONAL INTEGRATION AND AWARENESS**	**3 HOURS**
NI 1 National Integration: Importance & Necessity NI 2 Factors Affecting National Integration NI 3 Unity in Diversity & Role of NCC in Nation Building NI 4 Threats to National Security		
UNIT-3	**PERSONALITY DEVELOPMENT**	**3 HOURS**
PD 1 Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving PD 2 Communication Skills PD 3 Group Discussion: Stress & Emotions		

UNIT-4	**LEADERSHIP**	**2 HOURS**
L 1 Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code L 2 Case Studies: Shivaji, Jhasi Ki Rani		
UNIT-5	**SOCIAL SERVICE AND COMMUNITY DEVELOPMENT**	**4 HOURS**
SS 1 Basics, Rural Development Programmes, NGOs, Contribution o Youth SS 2 Protection of Children and Women Safety SS 3 Road / Rail Travel Safety SS 4 New Initiatives SS 5 Cyber and Mobile Security Awareness		
	TOTAL LECTURE HOURS	**15 HOURS**

SEMESTER III

COURSE CODE	COURSE TITLE	L	T	P	J	C
22BST302	**PROBABILITY AND RANDOM PROCESSES**	**3**	**2**	**0**	**0**	**4**
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

After studying this course, you should be able to:

1. To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.
2. To understand the basic concepts of probability, one- and two-dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.
3. To understand the basic concepts of random processes which are widely used in IT fields.
4. To understand the concept of correlation and spectral densities.
5. To understand the significance of linear systems with random inputs.

COURSE OUTCOME:

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

1. Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
2. Understand the basic concepts of one- and two-dimensional random variables and apply in engineering applications.
3. Apply the concept random processes in engineering disciplines.
4. Understand and apply the concept of correlation and spectral densities.
5. The students will have an exposure of various distribution functions and help in acquiring skills in handling situations involving more than one variable. Able to analyse the response of random inputs to linear time invariant systems.

UNIT-1	**PROBABILITY AND RANDOM VARIABLES**	**12 hours**

Probability – Axioms of probability – Conditional probability – Baye ‘s theorem – Discrete and continuous random variables – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.		
UNIT-2	**TWO – DIMENSIONAL RANDOM VARIABLES**	**12 hours**
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables		
UNIT-3	**RANDOM PROCESSES**	**12 hours**
Classification – Stationary process – Markov process – Markov chain – Poisson process		
UNIT-4	**CORRELATION AND SPECTRAL DENSITIES**	**12 hours**
Auto correlation functions – Cross correlation functions – Properties – Power spectral density – Cross spectral density – Properties.		
UNIT-5	**LINEAR SYSTEMS WITH RANDOM INPUTS**	12 hours
Linear time invariant system – System transfer function – Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.		
	Total Lecture hours:	60 hours

TEXT BOOK(S)

1.	Ibe, O.C.," Fundamentals of Applied Probability and Random Processes ", 1st Indian Reprint, Elsevier, 2007
2.	Peebles, P.Z., "Probability, Random Variables and Random Signal Principles ", Tata McGraw Hill, 4th Edition, New Delhi, 2002.

REFERENCE BOOKS

1.	Cooper. G.R., McGillem. C.D., "Probabilistic Methods of Signal and System Analysis", Oxford University Press, New Delhi, 3rd Indian Edition, 2012
2.	Hwei Hsu, "Schaum‘s Outline of Theory and Problems of Probability, Random Variables and Random Processes ", Tata McGraw Hill Edition, New Delhi, 2004.
3.	Miller. S.L. and Childers. D.G., —Probability and Random Processes with Applications to Signal Processing and Communications ", Academic Press, 2004.
4.	Stark. H. and Woods. J.W., —Probability and Random Processes with Applications to Signal Processing ", Pearson Education, Asia, 3rd Edition, 2002.
5.	Yates. R.D. and Goodman. D.J., —Probability and Stochastic Processes", Wiley India Pvt. Ltd., Bangalore, 2nd Edition, 2012.

COURSE CODE	COURSE TITLE	L	T	P	J	C
22EST401	ENVIRONMENTAL SCIENCES AND SUSTAINABILITY	2	0	0	0	2
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

After studying this course, you should be able to:

1. To study the nature and facts about environment.

2. To finding and implementing scientific, technological, economic and political solutions to 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 human world; 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:

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

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 on the following after completing the course.
2. Public awareness of environmental is at infant stage.
3. Ignorance and incomplete knowledge have led to misconceptions
4. Development and improvement in std. of living has lead to serious environmental disasters

UNIT-1	ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY	6 HOURS

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-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ.

UNIT-2	ENVIRONMENTAL POLLUTION	6 HOURS

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	6 HOURS

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

UNIT-4	SOCIAL ISSUES AND THE ENVIRONMENT	6 HOURS

Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols- Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-A case study.

UNIT-5	HUMAN POPULATION AND THE ENVIRONMENT	6 HOURS
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 – Case studies.		
	TOTAL LECTURE HOURS:	**30HOURS**

TEXT BOOK(S)

1.	Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.
2.	Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006
3.	Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition,Pearson Education, 2004.

REFERENCE BOOKS

1.	Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD,New Delhi,2007.
2.	Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) PVT, LTD, Hydrabad, 2015
3.	Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.

COURSE CODE	COURSE TITLE	L	T	P	J	C
22VLT301	SIGNALS AND SYSTEMS	3	2	0	0	4
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

After studying this course, you should be able to:

1. To understand the basic properties of signal & systems.
2. To know the methods of characterization of LTI systems in time domain.
3. To analyze continuous time signals and system in the Fourier and Laplace domain.
4. To analyze discrete time signals and system in the Fourier and Z transform domain.

COURSE OUTCOME:

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

1. Determine if a given system is linear/causal/stable.
2. Determine the frequency components present in a deterministic signal.
3. Characterize continuous LTI systems in the time domain and frequency domain.
4. Characterize discrete LTI systems in the time domain and frequency domain.
5. Compute the output of an LTI system in the time and frequency domains.

UNIT-1	CLASSIFICATION OF SIGNALS AND SYSTEMS	9 HOURS

Standard signals- Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids Classification of signals – Continuous time (CT) and Discrete Time (DT) signals, Periodic & aperiodic signals, Deterministic & Random signals, Energy & Power signals -Classification of systems- CT systems and DT systems- – Linear & Nonlinear, Time-variant & Time-invariant, Causal & Non-causal, Stable & Unstable.		
UNIT-2	**ANALYSIS OF CONTINUOUS TIME SIGNALS**	**9 HOURS**
Fourier series for periodic signals - Fourier Transform – properties- Laplace Transforms and Properties		
UNIT-3	**LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS**	**9 HOURS**
Impulse response - convolution integrals- Differential Equation- Fourier and Laplace transforms in Analysis of CT systems - Systems connected in series / parallel.		
UNIT-4	**ANALYSIS OF DISCRETE TIME SIGNALS**	**9 HOURS**
Sampling and Quantization, Fourier Transform of discrete time signals (DTFT)– Properties of DTFT - Z Transform & Properties.		
UNIT-5	**LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS**	**9 HOURS**
Impulse response–Difference equations -Convolution sum- Discrete Fourier Transform and Z Transform Analysis of Recursive & Non-Recursive systems-DT systems connected in series and parallel.		
	TOTAL LECTURE HOURS:	**45 HOURS**
TEXT BOOK(S)		
1.	Oppenheim, Willsky and Hamid, “Signals and Systems”, 2nd Edition, Pearson Education, New Delhi, 2015.(Units I - V)	
2.	Simon Haykin, Barry Van Veen, “Signals and Systems”, 2nd Edition, Wiley, 2002	
REFERENCE BOOKS		
1.	B. P. Lathi, “Principles of Linear Systems and Signals”, 2nd Edition, Oxford, 2009.	
2.	M. J. Roberts, “Signals and Systems Analysis using Transform methods and MATLAB”, McGraw- Hill Education, 2018.	
3.	John Alan Stuller, “An Introduction to Signals and Systems”, Thomson, 2007.	

COURSE CODE	**COURSE TITLE**	**L**	**T**	**P**	**J**	**C**
22ECT303	**DIGITAL ELECTRONICS**	**3**	**0**	**0**	**0**	**3**
		Syllabus version			v. 1.0	
COURSE OBJECTIVES:						

After studying this course, you should be able to: At the end of the course, the student will be able to

1. To present the fundamentals of digital circuits and simplification methods
2. To practice the design of various combinational digital circuits using logic gates
3. To bring out the analysis and design procedures for synchronous and asynchronous sequential circuits
4. To learn integrated circuit families.
5. To introduce semiconductor memories and related technology

COURSE OUTCOME:

After studying this course, you should be able to: At the end of the course, the student will be able to

1. Use Boolean algebra and simplification procedures relevant to digital logic.
2. Design various combinational digital circuits using logic gates.
3. Analyse and design synchronous sequential circuits.
4. Analyse and design asynchronous sequential circuits.
5. Build logic gates and use programmable device

UNIT-1	**BASIC CONCEPTS**	**9 HOURS**

Review of number systems-representation-conversions, Review of Boolean algebra- theorems, sum of product and product of sum simplification, canonical forms min term and max term, Simplification of Boolean expressions - Karnaugh map, completely and incompletely specified functions, Basic Gates, Implementation of Boolean expressions using universal gates, Tabulation methods**.**

UNIT-2	**COMBINATIONAL LOGIC CIRCUITS**	**9 HOURS**

Problem formulation and design of combinational circuits - Code-Converters, Half and Full Adders, Binary Parallel Adder — Carry look ahead Adder, BCD Adder, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/ Demux

UNIT-3	**SYNCHRONOUS SEQUENTIAL CIRCUITS**	**9 HOURS**

Latches, Flip flops – SR, JK, T, D, Master/Slave FF, Triggering of FF, Analysis and design of clocked sequential circuits – Moore/Mealy models, state minimization, state assignment, Counters- Ripple Counters, Ring Counters, Shift registers, Universal Shift Register.

UNIT-4	**ASYNCHRONOUS SEQUENTIAL CIRCUITS**	**9 HOURS**

Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments, Hazards, Essential Hazards, Pulse mode sequential circuits, Design of Hazard free circuits

UNIT-5	**LOGIC FAMILIES AND PROGRAMMABLE LOGIC DEVICES**	**9 HOURS**

Implementation of combinational logic/sequential logic design using standard ICs, PROM, PLA and PAL, basic memory, static ROM, PROM, EPROM, EEPROM EAPROM

TOTAL LECTURE HOURS:	**45 HOURS**

TEXT BOOK(S)

1.	M. Morris Mano and Michael D. Ciletti, “Digital Design”, 5th Edition, Pearson, 2014.
2.	Thomas L. Floyd, “Digital Fundamentals”, 10th Edition, Pearson Education Inc, 2011
REFERENCE BOOKS	
1.	Charles H.Roth. “Fundamentals of Logic Design”, 6th Edition, Thomson Learning, 2013.
2.	S.Salivahanan and S.Arivazhagan“Digital Electronics”, Ist Edition, Vikas Publishing House pvt Ltd, 2012.
3.	Soumitra Kumar Mandal “ Digital Electronics”, McGraw Hill Education Private Limited,2016.

Course Code	Course Title	L	T	P	J	C
22VLT302	INTRODUCTION TO VLSI	3	0	0	0	3
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

After studying this course, you should be able to:

1. To impart knowledge on the basics of VLSI Life cycle
2. To impart knowledge on the basics of testing and verification of logic design
3. To design for low power and design for performance
4. To work in small groups and bring together design components into a full custom chip
5. To study the Fabrication and Packaging

COURSE OUTCOME:

After studying this course, you should be able to: At the end of the course, the student will be able to

1. Understand the intricacies in VLSI Design flow
2. Understand overall process of VLSI Design flow starting from system level all the way to the transistor level
3. Obtained the knowledge of fundamentals of VLSI Design principles
4. Experience of designing a full custom integrated circuit chip working in a design team
5. Skills to communicate their design experience through a detailed report and a short presentation to the class

UNIT-1	INTRODUCTION	9 HOURS

System & Architectural Design: Defining a system specification, performance analysis, cost analysis, identifying various functional blocks/modules; categorizing them in terms of digital, analog, RF and mixed sign0061l blocks

UNIT-2	VERIFICATION AND TESTING	9 HOURS

Functional verification, logic design: Verifying the functionality of blocks, behavioral description, logic minimization, synthesis, verification and testing

UNIT-3	CIRCUIT OPTIMIZATION AND DESIGN	9 HOURS

Circuit Optimization and Physical Design: Optimization of synthesized blocks for various

performance metric, Introduction to placement and route, Layout Vs Schematic (LVS) verification, Design for Manufacturability.		
UNIT-4	**LAYOUT DESIGN**	**9 HOURS**
Tape Out: Post layout simulations, Process Voltage Testing, Process Design Kit, Design Rule Check, GDSII		
UNIT-5	**FABRICATION AND PACKAGING**	**9 HOURS**
Fabrication and Packaging: CMOS process flow, dicing, various types of packaging.		
	TOTAL LECTURE HOURS:	**45 HOURS**

TEXT BOOK(S)	
1.	Sneh Saurabh, “Introduction to VLSI Design flow”, Cambridge University Press
2.	N. H. E. Weste and C. Harris, “Principles of CMOS VLSI Design: A System Perspective, 3rd Edition, Pearson Education 2007
3.	M.Morris Mano and Michel.D.Ciletti, Digital Design with an introduction to HDL, VHDL and Verilog, Sixth edition Pearson education
REFERENCE BOOKS	
1.	Digital VLSI Chip Design with Cadence and Synopsys CAD Tools, Eric Brunvand, Addison Wesley, 2009
2.	CMOS VLSI Design: Circuits and Systems Perspective, by N Weste and D. Harris, Fourth edition, Addison Wesley, 2010

COURSE CODE	**COURSE TITLE**	**L**	**T**	**P**	**J**	**C**
22HST301	**ENTREPRENEURSHIP AND STARTUPS**	**2**	**0**	**0**	**0**	**2**
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

After studying this course, you should be able to:

1. To provide practical, proven tools for transforming an idea into a product or service that creates value for others
2. To build a winning strategy, how to shape a unique value proposition, prepare a business plan
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 the course, the student will be able to

1. Transform ideas into real products, services, and processes by validating the idea, testing it, and turning it into a growing, profitable, and sustainable business.
2. Identify the major steps and requirements to estimate the potential of an innovative idea as the basis of an innovative project.
3. Reach creative solutions via an iteration of a virtually endless stream of world-changing ideas 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: Means the skills required to be an entrepreneur, the entrepreneurial decision process, Role models, Mentors and Support system.

UNIT-2	**BUSINESS PLAN PREPARATION AND PROTOTYPING**	**9 HOURS**

Business Opportunity Identification and Preparing a Business Plan Business ideas, methods of generating ideas, and opportunity recognition, Idea Generation Process, Feasibility study, preparing a Business Plan: Meaning and significance of a business plan, components of a business plan. Experimentation and incubation, 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 Organizational 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	**MANAGEMENT OF SMALL BUSINESS**	**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**

TEXT BOOK(S)

1.	Stephen Key, “One Simple Idea for Start-ups and Entrepreneurs: Live Your Dreams and

	Create Your Own Profitable Company", 1st Edition, Tata Mc Graw hill Company, New Delhi, 2013.
2.	Charles Bamford and Garry Bruton, "ENTREPRENEURSHIP: The Art, Science, and Process for Success", 2nd Edition, Tata Mc Graw hill Company, New Delhi, 2016.
REFERENCE BOOKS	
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.
3.	Edward D. Hess, "Growing an Entrepreneurial Business: Concepts and Cases", Stanford Business Books, 2011.

COURSE CODE	**COURSE TITLE**	**L**	**T**	**P**	**J**	**C**
22VLP301	**SIGNALS AND SYSTEMS LABORATORY**	**0**	**0**	**3**	**0**	**1.5**
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

After studying this course, you should be able to:

1. To understand the basic properties of signal & systems.
2. To know the methods of characterization of LTI systems in time domain.
3. To determine if a given system is linear/causal/stable.
4. To determine characterize LTI systems in the time domain and frequency domain.

COURSE OUTCOME:

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

1. Determine the frequency components present in a deterministic signal.
2. Characterize continuous LTI systems in the time domain and frequency domain.
3. Characterize discrete LTI systems in the time domain and frequency domain.

LIST OF EXPERIMENTS:

MATLAB / EQUIVALENT SOFTWARE PACKAGE.

1. Generation of elementary Discrete-Time sequences.
2. Linear and Circular convolutions.
3. Analyze the stability of a CT system with various inputs.
4. Analyze the stability of a DT system with various inputs
5. Construction of signals with different frequencies.
6. Reconstruct a signal from sample.

TOTAL LABORATORY HOURS:	**45 HOURS**

COURSE CODE	**COURSE TITLE**	**L**	**T**	**P**	**J**	**C**
22ECP302	**DIGITAL ELECTRONICS LABORATORY**	**0**	**0**	**3**	**0**	**1.5**
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

After studying this course, you should be able to:

1. Get practical experience in design, realization and verification of Demorgan's Theorem
2. Design Full/Parallel Adders and Subtractors
3. Design and learn Multiplexer using logic gates, Demultiplexer and Decoder
4. Verify the function of Flip-Flops
5. Design Shift registers and Counters using Flip flops

COURSE OUTCOME:

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

1. Justify NAND and NOR as Universal gates and verify SOP and POS expressions using them.
2. Verify De Morgan's Theorem for 2 variables using logic gates.
3. Design, Build and test combinational circuits such as adders, Subtractor, comparators, multiplexers demultiplexers and decoders.
4. Construct flips-flops using NAND gates and verify their functionality.
5. Realize synchronous and asynchronous counters and its applications using flip-flop IC's
6. Construct the types of shift registers using flip-flop IC's and verify their functionality.

LIST OF EXPERIMENTS:

1.To realize Basic gates (AND, OR, NOT) From Universal Gates (NAND & NOR).

2.To verify

(a) Demorgan's Theorem for 2 variables

(b) The sum-of product and product-of-sum expressions using universal gates

3. (a)To design and implement Half adder and Full Adder, Half Subtractor and Full subtractor

(b) 4-bit Parallel Adder Using IC 7483

4. (a) To realize (a) 4:1 and 8:1 Multiplexer using 74151 gate

(b) To realize 1:8 Demultiplexer

5. To Design 8:3 Encoder and 3:8 Decoder using IC74138

6.To design 4-bit comparator circuit using logic gates

7. To realize the following flip-flops using NAND Gates:

(a)Clocked SR Flip-Flop

(b)JK Flip-Flop

8. To realize the following shift registers using Ic7474:

(a) SISO (b) SIPO (c) PISO (d) PIPO

9.To design 4-bit synchronous Counter using JK Flip flops - Ic7476

10.To design 4 bit Ripple counter using JK Flip flops - IC7476

TOTAL LABORATORY HOURS:	**45 HOURS**

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 inter personal skills
4. Know the leader's qualities and develop as a leader
5.Undersating 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 inter personal skills
4. Develop leadership qualities
5. Able to make right decisions and solving conflicts

UNIT-1	**SELF ANALYSIS**	**6 HOURS**

Introduction, SWOT analysis, self-introspection, self confidence and self-esteem, Creativity -Out of the box 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**

Skills needed for a good leader, Types of leadership style, Assessment of leadership skills, Wheel of leadership, Personal, social and professional etiquette Emotional intelligence, Emotional quotient and 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.	SOFT SKILLS, 2015, Career Development Centre, Green Pearl Publications.

REFERENCE BOOKS

1.	Covey Sean, Seven Habits of Highly Effective Teens, New York, Fireside Publishers, 1998.

2.	Carnegie Dale, How to Win Friends and Influence People, New York: Simon & Schuster, 1998.
3.	Thomas A Harris, I am ok, You are ok, New York-Harper and Row, 1972.
4	Daniel Coleman, Emotional Intelligence, Bantam Book, 2006.
5	Carnegie Dale, How to stop worrying and start living, New York: Simon & Schuster, 1985.
6	http://empower.srmuniv.ac.in (online LMS)

SEMESTER –IV

Course Code	Course Title	L	T	P	J	C
22VLT401	ANALOG AND DIGITAL COMMUNICATION	3	2	0	0	4
		Syllabus version				v. 1.0

COURSE OBJECTIVES:

After studying this course, you should be able to:

1. Understand analog and digital communication techniques.
2. Learn data and pulse communication techniques.
3. Be familiarized with source and Error control coding.
4. Gain knowledge on multi-user radio communication

COURSE OUTCOME:

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

1. Apply analog and digital communication techniques.
2. Use data and pulse communication techniques.
3. Analyze Source and Error control coding.
4. Utilize multi-user radio communication.

UNIT-1	ANALOG COMMUNICATION	9 HOURS

Introduction to Communication Systems - Modulation – Types - Need for Modulation. Theory of Amplitude Modulation - Evolution and Description of SSB Techniques - Theory of Frequency and Phase Modulation – Comparison of Analog Communication Systems (AM – FM – PM).

UNIT-2	PULSE AND DATA COMMUNICATION	9 HOURS

Pulse Communication: Pulse Amplitude Modulation (PAM) – Pulse Time Modulation (PTM) – Pulse code Modulation (PCM) - Comparison of various Pulse Communication System (PAM – PTM – PCM). Data Communication: History of Data Communication - Standards Organizations for Data Communication- Data Communication Circuits - Data Communication Codes - Data communication Hardware - serial and parallel interfaces.

UNIT-3	DIGITAL COMMUNICATION	9 HOURS

Amplitude Shift Keying (ASK) – Frequency Shift Keying (FSK)–Phase Shift Keying (PSK) – BPSK – QPSK – Quadrature Amplitude Modulation (QAM) – 8 QAM – 16 QAM – Bandwidth Efficiency– Comparison of various Digital Communication System (ASK – FSK – PSK – QAM)		
UNIT-4	**SOURCE AND ERROR CONTROL CODING**	**9 HOURS**
Entropy, Source encoding theorem, Shannon fano coding, Huffman coding, mutual information, channel capacity, Error Control Coding, linear block codes, cyclic codes - ARQ Techniques.		
UNIT-5	**MULTI-USER RADIO COMMUNICATION**	**9 HOURS**
Global System for Mobile Communications (GSM) - Code division multiple access (CDMA) – Cellular Concept and Frequency Reuse - Channel Assignment and Handover Techniques - Overview of Multiple Access Schemes - Satellite Communication - Bluetooth.		
	TOTAL LECTURE HOURS:	**30 HOURS**

TEXT BOOK(S)

1.	Wayne Tomasi, “Advanced Electronic Communication Systems”, 6th Edition, Pearson Education, 2009.

REFERENCE BOOKS

1.	Simon Haykin, “Communication Systems”, 4th Edition, John Wiley & Sons 2004
2.	Rappaport T.S, "Wireless Communications: Principles and Practice", 2nd Edition, Pearson Education, 2007
3.	H.Taub, D L Schilling and G Saha, “Principles of Communication”, 3 rd Edition, Pearson Education, 2007.
4	B. P.Lathi, “Modern Analog and Digital Communication Systems”, 3 rd Edition, Oxford University Press, 2007.
5	Blake, “Electronic Communication Systems”, Thomson Delmar Publications, 2002.
6	Martin S.Roden, “Analog and Digital Communication System”, 3 rd Edition, Prentice Hall of India, 2002.
7.	B.Sklar, “Digital Communication Fundamentals and Applications” 2 nd Edition Pearson Education 2007.

COURSE CODE	**COURSE TITLE**	**L**	**T**	**P**	**J**	**C**
22ECT402	**LINEAR INTEGRATED CIRCUITS AND APPLICATIONS**	**3**	**0**	**0**	**0**	**3**
		Syllabus version			v. 1.0	
COURSE OBJECTIVES:						

After studying this course, you should be able to:

1. To introduce the basic building blocks of linear integrated circuits
2. To learn the linear and non-linear applications of operational amplifiers
3. To learn the theory of ADC and DAC
4. To introduce the concepts of waveform generation and introduce some special function ICs
5. To introduce the theory and applications of analog multipliers and PLL

COURSE OUTCOME:

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

1. Design linear and nonlinear applications of OP – AMPS
2. Design applications using analog multiplier and PLL
3. Design ADC and DAC using OP – AMPS
4. Analyze special function ICs
5. Gain knowledge of Analog multiplier and PLL

UNIT-1	BASICS OF OPERATIONAL AMPLIFIERS	9 HOURS

Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, Basic information about op-amps – Ideal Operational Amplifier - General operational amplifier stages -and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations.

UNIT-2	APPLICATIONS OF OPERATIONAL AMPLIFIERS	9 HOURS

Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.

UNIT-3	ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS	9 HOURS

Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode R - 2R Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type - A/D Converter using Voltage-to-Time Conversion - Over-sampling A/D Converters, Sigma – Delta converters

UNIT-4	WAVEFORM GENERATORS AND SPECIAL FUNCTION ICS	9 HOURS

Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator -Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Optocouplers and fiber optic IC.

UNIT-5	ANALOG MULTIPLIER AND PLL	9 HOURS

Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, closed loop analysis, Voltage controlled oscillator, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing and clock synchronization.	
TOTAL LECTURE HOURS:	**45 HOURS**
TEXT BOOK(S)	
1.	D.Roy Choudhry, Shail Jain, “Linear Integrated Circuits”, New Age International Pvt. Ltd., 2018, Fifth Edition. (Unit I – V)
2.	Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, 4th Edition, Tata Mc Graw-Hill, 2016 (Unit I – V)
REFERENCE BOOKS	
1.	Ramakant A. Gayakwad, “OP-AMP and Linear ICs”, 4th Edition, Prentice Hall / Pearson Education, 2015
2.	Robert F.Coughlin, Frederick F.Driscoll, “Operational Amplifiers and Linear Integrated Circuits”, Sixth Edition, PHI, 2001.
3.	S.Salivahanan & V.S. Kanchana Bhaskaran, “Linear Integrated Circuits”, TMH,2nd Edition, 4th Reprint, 2016

COURSE CODE	COURSE TITLE	L	T	P	J	C
22VLT402	DIGITAL SIGNAL PROCESSING	3	0	2	0	4
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

After studying this course, you should be able to:

1. To learn discrete fourier transform, properties of DFT and its application to linear filtering
2. To understand the characteristics of digital filters, design digital IIR and FIR filters and apply these filters to filter undesirable signals in various frequency bands
3. To understand the effects of finite precision representation on digital filters
4. To understand the fundamental concepts of multi rate signal processing and its applications
5. To introduce the concepts of adaptive filters and its application to communication engineering

COURSE OUTCOME:

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

1. Apply DFT for the analysis of digital signals and systems
2. Design IIR and FIR filters
3. Characterize the effects of finite precision representation on digital filters
4. Design multirate filters
5. Apply adaptive filters appropriately in communication systems

UNIT-1	DISCRETE FOURIER TRANSFORM	9 HOURS

Sampling Theorem, concept of frequency in discrete-time signals, summary of analysis & synthesis equations for FT & DTFT, frequency domain sampling, Discrete Fourier transform (DFT) - deriving DFT from DTFT, properties of DFT - periodicity, symmetry, circular convolution. Linear filtering using DFT. Filtering long data sequences - overlap save and overlap add method. Fast computation of DFT - Radix-2 Decimation-in-time (DIT) Fast Fourier transform (FFT), Decimation-in-frequency (DIF) Fast Fourier transform (FFT). Linear filtering using FFT.

UNIT-2	INFINITE IMPULSE RESPONSE FILTERS	9 HOURS

Characteristics of practical frequency selective filters. characteristics of commonly used analog filters - Butterworth filters, Chebyshev filters. Design of IIR filters from analog filters (LPF, HPF, BPF, BRF) - Approximation of derivatives, Impulse invariance method, Bilinear transformation. Frequency 81 transformation in the analog domain. Structure of IIR filter - direct form I, direct form II, Cascade, parallel realizations

UNIT-3	FINITE IMPULSE RESPONSE FILTERS	9 HOURS

Design of FIR filters - symmetric and Anti-symmetric FIR filters - design of linear phase FIR filters using Fourier series method - FIR filter design using windows (Rectangular, Hamming and Hanning window), Frequency sampling method. FIR filter structures - linear phase structure, direct form realizations

UNIT-4	FINITE WORD LENGTH EFFECTS	9 HOURS

Fixed point and floating point number representation - ADC - quantization - truncation and rounding - quantization noise - input / output quantization - coefficient quantization error - product quantization error - overflow error - limit cycle oscillations due to product quantization and summation - scaling to prevent overflow

UNIT-5	DSP APPLICATIONS	9 HOURS

Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor – Adaptive Filters: Introduction, Applications of adaptive filtering to equalization-DSP ArchitectureFixed and Floating point architecture principles	
TOTAL LECTURE HOURS:	**45 HOURS**

LIST OF EXPERIMENTS:

1. Generation of elementary Discrete-Time sequences
2. Linear and Circular convolutions
3. Auto correlation and Cross Correlation
4. Frequency Analysis using DFT
5. Design of FIR filters (LPF/HPF/BPF/BSF) and demonstrates the filtering operation
6. Design of Butterworth and Chebyshev IIR filters (LPF/HPF/BPF/BSF) and demonstrate the filtering operations
7. Study of architecture of Digital Signal Processor
8. Perform MAC operation using various addressing modes
9. Generation of various signals and random noise
10. Design and demonstration of FIR Filter for Low pass, High pass, Band pass and Band stop filtering
11. Design and demonstration of Butter worth and Chebyshev IIR Filters for Low pass, High pass, Band pass and Band stop filtering
12. Implement an Up-sampling and Down-sampling operation in DSP Processor

TOTAL PRACTICAL HOURS:	**30 HOURS**
TOTAL HOURS	**75 HOURS**

TEXT BOOK(S)/REFERENCE BOOK

1.	John G. Proakis and Dimitris G.Manolakis, Digital Signal Processing – Principles, Algorithms and Applications, Fourth Edition, Pearson Education / Prentice Hall, 2007.
2.	A. V. Oppenheim, R.W. Schafer and J.R. Buck, —Discrete-Time Signal Processing", 8th Indian Reprint, Pearson, 2004

REFERENCE BOOK

1.	Emmanuel C. Ifeachor& Barrie. W. Jervis, "Digital Signal Processing", Second Edition, Pearson Education / Prentice Hall, 2002
2.	Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", Tata Mc Graw Hill, 2007.
3.	Andreas Antoniou, "Digital Signal Processing", Tata Mc Graw Hill, 2006

COURSE CODE	COURSE TITLE	L	T	P	J	C
22VLT403	INTRODUCTION TO MICROFABRICATION	3	0	0	0	3
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

After studying this course, you should be able to:

1. To learn various cleanroom processes in the classroom setting
2. To re-define the microfabrication terms learned in the classroom
3. To experience the microfabrication processes in the cleanroom
4. To create video clips of these processes with a personal style.

COURSE OUTCOME:

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

1. Elucidate the CMOS process flow
2. Analyze various critical processing steps in microfabrication
3. Appreciate the advanced methods involved in IC fabrication.
4. Analyze the advancements in CMOS process fabrication with scaling in technology

UNIT-1	INTRODUCTION	9 HOURS

History of IC's; Operation & Models for Devices of Interest: CMOS and MEMS. Electronic Materials: Crystal Structures, Defects in Crystals, Si, Poly Si, Si Crystal Growth. Clean room and Wafer Cleaning: Definition, Need of Clean Room, RCA cleaning of Si.

UNIT-2	OXIDATION	9 HOURS

Dry and Wet Oxidation, Kinetics of Oxidation, Oxidation Rate Constants, Dopant Redistribution, Oxide Charges, Device Isolation, LOCOS, Oxidation System.

UNIT-3	LITHOGRAPHY	9 HOURS

Lithography: Overview of Lithography, Radiation Sources, Masks, Photoresist, Components of Photoresist Optical Aligners, Resolution, Depth of Focus, Advanced Lithography: E-beam Lithography, X-ray Lithography, Ion Beam Lithography.

UNIT-4	DIFFUSION	9 HOURS

Pre-Deposition and Drive-in Diffusion Modeling, Dose, 2-Step Diffusions, Successive Diffusion, Lateral Diffusion, Series Resistance, Junction Depth, Irvin's Curves, Diffusion System.

UNIT-5	ETCHING	9 HOURS

Etching: Anisotropy, Selectivity, Wet Etching, Plasma Etching, Reactive Ion Etching. Overview of Interconnects, Contacts, Metal gate/Poly Gate, Metallization, Problems in Aluminum Metal contacts, Al spike, Electromigration, Metal Silicides, Multi-Level Metallization, Planarization, Inter Metal Dielectric

TOTAL LECTURE HOURS:	45 HOURS

TEXT BOOK(S)

1.	Silicon VLSI Technology, Plummer, Deal and Griffin ,1st Edition, Pearson Education,2009
2.	Fundamental of Semiconductor Fabrication, Sze and May,2nd Edition, Wiley India, 2009
3.	Silicon Process Technology, S K Gandhi,2nd Edition, Wiley India,2009
REFERENCE BOOKS	
1.	James Plummer, M. Deal and P.Griffin, Silicon VLSI Technology, Prentice Hall Electronics
2.	Stephen Campbell, The Science and Engineering of Microelectronics, Oxford University Press, 1996
3.	S.M. Sze (Ed), VLSI Technology, 2nd Edition, McGraw Hill, 1988
4.	C.Y. Chang and S.M.Sze (Ed), ULSI Technology, McGraw Hill Companies Inc, 1996.

COURSE CODE	**COURSE TITLE**	**L**	**T**	**P**	**J**	**C**
22VLT404	**COMPUTER ARCHITECTURE AND ORGANIZATION**	**3**	**0**	**0**	**0**	**3**
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

After studying this course, you should be able to:

1. To make students understand the basic structure and operation of digital computer
2. To familiarize with implementation of fixed point and floating-point arithmetic operations
3. To study the design of data path unit and control unit for processor
4. To understand the concept of various memories and interfacing
5. To introduce the parallel processing technique

COURSE OUTCOME:

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

1. Describe data representation, instruction formats and the operation of a digital computer
2. Illustrate the fixed point and floating-point arithmetic for ALU operation
3. Discuss about implementation schemes of control unit and pipeline performance
4. Explain the concept of various memories, interfacing and organization of multiple processors
5. Discuss parallel processing technique and unconventional architectures

UNIT-1	**COMPUTER ORGANIZATION & INSTRUCTIONS**	**9 HOURS**

Basics of a computer system: Evolution, Ideas, Technology, Performance, Power wall, Uniprocessors to Multiprocessors. Addressing and addressing modes. Instructions:

Operations and Operands, Representing instructions, Logical operations, control operations		
UNIT-2	**ARITHMETIC**	**9 HOURS**
Fixed point Addition, Subtraction, Multiplication and Division. Floating Point arithmetic, High performance arithmetic, Subword parallelism		
UNIT-3	**THE PROCESSOR**	**9 HOURS**
Introduction, Logic Design Conventions, Building a Datapath - A Simple Implementation scheme - An Overview of Pipelining - Pipelined Datapath and Control. Data Hazards: Forwarding versus Stalling, Control Hazards, Exceptions, Parallelism via Instructions.		
UNIT-4	**MEMORY AND I/O ORGANIZATION**	**9 HOURS**
Memory hierarchy, Memory Chip Organization, Cache memory, Virtual memory. Parallel Bus Architectures, Internal Communication Methodologies, Serial Bus Architectures, Mass storage, Input and Output Devices.		
UNIT-5	**ADVANCED COMPUTER ARCHITECTURE**	**9 HOURS**
Parallel processing architectures and challenges, Hardware multithreading, Multicore and shared memory multiprocessors, Introduction to Graphics Processing Units, Clusters and Warehouse scale computers - Introduction to Multiprocessor network topologies		
	TOTAL LECTURE HOURS:	**45 HOURS**

TEXT BOOK(S)

1.	David A. Patterson and John L. Hennessey, “Computer Organization and Design”, Fifth edition, Morgan Kauffman / Elsevier, 2014. (UNIT I-V)
2.	Miles J. Murdocca and Vincent P. Heuring, “Computer Architecture and Organization: An Integrated approach”, Second edition, Wiley India Pvt Ltd, 2015 (UNIT IV,V)

REFERENCE BOOKS

1.	V. Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, “Computer Organization“, Fifth edition, Mc Graw-Hill Education India Pvt Ltd, 2014.
2.	William Stallings “Computer Organization and Architecture”, Seventh Edition, Pearson Education, 2006.
3.	Govindarajalu, “Computer Architecture and Organization, Design Principles and Applications", Second edition, McGraw-Hill Education India Pvt Ltd, 2014.

COURSE CODE	COURSE TITLE	L	T	P	J	C
22ECP401	LINEAR INTEGRATED CIRCUITS LAB	0	0	3	0	1.5
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

After studying this course, you should be able to:

1. To gain hands on experience in designing electronic circuits.
2. To learn simulation software used in circuit design.
3. To learn the fundamental principles of amplifier circuits.
4. To differentiate feedback amplifiers and oscillators.
5. To differentiate the operation of various multivibrators.

COURSE OUTCOME:

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

1. Analyze various types of feedback amplifiers.
2. Design oscillators, tuned amplifiers, wave-shaping circuits and multivibrators.
3. Design and simulate feedback amplifiers, oscillators, tuned amplifiers, wave-shaping circuits and multivibrators, filters using SPICE Tool.
4. Design amplifiers, oscillators, D-A converters using operational amplifiers.
5. Design filters using op-amp and perform an experiment on frequency response.

LIST OF EXPERIMENTS:

Design and Analysis of the Following Circuits

1. Series and Shunt feedback amplifiers-Frequency response, Input and output impedance
2. RC Phase shift oscillator and Wien Bridge Oscillator
3. Hartley Oscillator and Colpitts Oscillator
4. RC Integrator and Differentiator circuits using Op-Amp
5. Clippers and Clampers
6. Instrumentation amplifier
7. Active low-pass, High pass & Band pass filters
8. PLL Characteristics and its use as frequency multiplier, clock synchronization
9. R-2R ladder type D-A converter using Op-Amp

Simulation Using SPICE (Using Transistor):

1. Tuned Collector Oscillator
2. Twin -T Oscillator / Wein Bridge Oscillator
3. Double and Stagger tuned Amplifiers
4. Bistable Multivibrator
5. Schmitt Trigger circuit with Predictable hysteresis
6. Analysis of power amplifier

Total Lecture hours:	45 hours

COURSE CODE	COURSE TITLE	L	T	P	J	C
22VLP401	ANALOG AND DIGITAL COMMUNICATION LABORATORY	0	0	3	0	1.5
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

After studying this course, you should be able to:

1. To visualize the effects of sampling and TDM
2. To Implement AM & FM modulation and demodulation
3. To implement PCM & DM
4. To simulate Digital Modulation schemes
5. To simulate Error control coding schemes.

COURSE OUTCOME:

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

1. Simulate & validate the various functional modules of a communication system
2. Demonstrate their knowledge in base band signaling schemes through implementation of digital modulation schemes
3. Apply various channel coding schemes & demonstrate their capabilities towards the improvement of the noise performance of communication system
4. Simulate end-to-end communication Link.

LIST OF EXPERIMENTS:

1. Signal Sampling and reconstruction
2. Time Division Multiplexing
3. AM Modulator and Demodulator
4. FM Modulator and Demodulator
5. Pulse Code Modulation and Demodulation
6. Delta Modulation and Demodulation
7. Line coding schemes
8. Simulation of ASK, FSK, and BPSK generation schemes
9. Simulation of DPSK, QPSK and QAM generation schemes
10. Simulation of signal constellations of BPSK, QPSK and QAM
11. Simulation of ASK, FSK and BPSK detection schemes
12. Simulation of Linear Block and Cyclic error control coding schemes
13. Simulation of Convolutional coding scheme
14. Communication link simulation

Total Laboratory hours:	**45 hours**

COURSE CODE	COURSE TITLE	L	T	P	J	C
22EEP401	QUANTITATIVE APTITUDE AND LOGICAL REASONING -1	0	0	2	0	1
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

After studying this course, you should be able to:

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

COURSE OUTCOME:

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

2. Solve quantitative aptitude problems
3. Apply logical Reasoning
4. Developing quantitative literacy skills

LIST OF EXPERIMENTS:

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:	30 Hours