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 2022-2023 onwards)

B.E – BIOMEDICAL ENGINEERING

About the Department

Biomedical Engineering program was established in the year 2020 with intake of 30 students. Biomedical Engineering is the application of the principles and problem-solving techniques of engineering to biology and medicine. Biomedical Engineering is evident throughout healthcare, from diagnosis and analysis to treatment and recovery, and has entered the public conscience though the proliferation of implantable medical devices, such as pacemakers and artificial hips, to more futuristic technologies such as stem cell engineering and the 3-D printing of biological organs. Biomedical Engineers differ from other engineering disciplines that have an influence on human health in that biomedical engineers use and apply an intimate knowledge of modern biological principles in their Engineering design process. The study of biomedical engineering involves a broad array of diagnostic and therapeutic applications. This branch of engineering and sciences is a fascinating multidisciplinary area of study that entails the application of engineering techniques in order to assist practitioners like doctors and physicians in their healthcare practices. Study of this branch also helps them in the rehabilitation of disabled patients.

Vision

To develop into a Centre of Excellence in Biomedical Engineering, providing quality education, with orientation towards research and innovative development of health care products that will significantly enhance the quality of life.

Mission

- To educate students to understand the human body as an integrated system through quantitative engineering analysis and to use that understanding to design better health care devices and diagnostics.
- To impart in the students the skill-sets needed by the industry to become the best Biomedical Engineers.
- To endorse research to address grand challenges in biomedical engineering in a manner that education, employment and entrepreneurship for the benefit of the community.
- To enable students to be sensitive to the ethical issues pertinent to the Biomedical Engineering profession.

I. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To enable the graduates to demonstrate their skills in design and develop medical devices for health care system through the core foundation and knowledge acquired in engineering and biology.

PEO2: To enable the graduates to exhibit leadership in health care team to solve health care problems and make decisions with societal and ethical responsibilities.

PEO3: To Carryout multidisciplinary research, addressing human healthcare problems and sustain technical competence with ethics, safety and standards.

PEO4: To ensure that graduates will recognize the need for sustaining and expanding their technical competence and engage in learning opportunities throughout their careers.

II. PROGRAM OUTCOMES (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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.

PO4: 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.

PO5: 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.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: 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.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: 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.

PO11: 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.
PO12: 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.

III. PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: To design and develop diagnostic and therapeutic devices that reduces physician burnout and enhance the quality of life for the end user by applying fundamentals of Biomedical Engineering.

PSO2: To apply software skills in developing algorithms for solving healthcare related problems in various fields of Medical sector.

PSO3: To adapt to emerging information and communication technologies (ICT) to innovate ideas and solutions for current societal and scientific issues thereby developing indigenous medical instruments that are on par with the existing technology

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B.E- BIOMEDICAL ENGINEERING
CURRICULUM FOR SEMESTERS I TO VIII AND
SYLLABI FOR SEMESTERS I TO IV

SEMESTER I

S.No	COURSE CODE	COURSE TITLE	MODE	L	T	P	J	TCP	C	CAT
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	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	22BST201	Statistics and Transforms	L	3	2	0	0	5	4	BSC
3	22BMT201	Bioscience for Medical Engineering	L	3	0	0	0	3	3	PCC
4	22EST205	Basic Electrical and Electronics Engineering	L	3	0	0	0	3	3	ESC
5	22EST202	Engineering Graphics	L+P	1	0	4	0	5	3	ESC
6	22HSM201	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	22BMP201	Bioscience for Medical Engineering 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	22EST302	Electric and Electronic Circuits	L	3	0	0	0	3	3	ESC
3	22BMT301	Biomedical Sensors and Transducers	L	3	0	0	0	3	3	PCC
4	22BMT302	Anatomy and Human Physiology	L+P	3	0	2	0	5	4	PCC
5	22HST301	Entrepreneurship and startups*	L	2	0	0	0	2	2	HSMC
PRACTICAL COURSES										
6	22ESP301	Electric and Electronic Circuits Laboratory	P	0	0	4	0	4	2	ESC
7	22BMP301	Biomedical Sensors and Transducers Laboratory	P	0	0	4	0	4	2	PCC
EMPLOYABILITY ENHANCEMENT COURSE										
8	22EEP301	Soft Skills*	P	0	0	2	0	2	1	EEC
			TOTAL	14	02	12	00	28	21	

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	22BMT401	Bio Control Systems	L	3	0	0	0	3	3	PCC
2	22BMT402	Signal Processing	L+P	3	0	2	0	5	4	PCC
3	22BMT403	Biomedical Instrumentation	L+J	3	0	0	2	5	4	PCC
4	22BMT404	Analog and Digital Integrated Circuits	L	3	0	0	0	3	3	PCC
5	22EST401	Environmental Science and Sustainability	L	2	0	0	0	2	2	ESC
MANDATORY COURSE										
6	22NXP401	NCC/NSS/YRC Credit Course Level- II#	-	1	0	0	0	1	1#	-
PRACTICAL COURSES										
7	22BMP401	Biomedical Instrumentation Laboratory	P	0	0	4	0	4	2	PCC
8	22BMP402	Analog and Digital Integrated Circuits Laboratory	P	0	0	4	0	4	2	PCC
EMPLOYABILITY ENHANCEMENT COURSE										
9	22EEP401	Quantitative Analysis and Logical Reasoning-I*	P	0	0	2	0	2	1	EEC
			TOTAL	15	00	12	02	29	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	22BMT501	Diagnostic and Therapeutic Equipment	L	3	0	0	0	3	3	PCC
2	22BMT502	Microcontroller and Embedded Systems	L+P+J	2	0	2	2	6	4	PCC
3	22BMT503	Medical Image Processing	L+P	3	0	2	0	5	4	PCC
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	22BMP501	Diagnostic and Therapeutic Equipment Laboratory	P	0	0	4	0	4	2	PCC
EMPLOYABILITY ENHANCEMENT COURSE										
9	22EEP502	Internship*	P	0	0	0	0	0	1	EEC
			TOTAL	20	00	08	02	30	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 subject

SEMESTER VI

S.No	COURSE CODE	COURSE TITLE	MODE	PERIODS PER WEEK				TCP	C	CAT
				L	T	P	J			
THEORY COURSES										
1	22BMT601	Principles of Medical Imaging Techniques	L	3	0	0	0	3	3	PCC
2	22BMT602	Hospital and Equipment Management	L	3	0	0	0	3	3	PCC
OPEN ELECTIVE										
3		Open Elective-I	L	3	0	0	0	3	3	OEC
PROFESSIONAL ELECTIVE										
4		Professional Elective - II	L	3	0	0	0	3	3	PEC
5		Professional Elective - III	L	3	0	0	0	3	3	PEC
MANDATORY COURSE										
6		Mandatory Course - II*	L	3	0	0	0	3	0	MCC
7	22NXP601	NCC/NSS/YRC Credit Course Level- III#	-	1	0	0	0	1	1#	-
ENROLLMENT FOR B.E. / B.TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)										
8		Minor/Honour/remedial class**		3	0	0	0	3	3**	PEC**
PRACTICAL COURSES - EMPLOYABILITY ENHANCEMENT COURSE										
9	22EEP601	Quantitative Analysis and Logical Reasoning-II	P	0	0	2	0	2	1	EEC
10	22EEP602	Comprehensive Assessment*		0	0	2	0	2	1	EEC
PRACTICAL COURSES										
11	22BMP601	Hospital Training	P	0	0	4	0	4	2	PCC
12	22BMP602	Simulation Laboratory	P	0	0	2	0	2	1	PCC
			TOTAL	22	00	10	00	32	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
 # 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	22BMT701	Artificial Intelligence and Machine Learning	L+P	3	0	2	0	5	4	PCC
2	22BMT702	Clinical Engineering	L	3	0	0	0	3	3	PCC
OPEN ELECTIVE										
3		Open Elective-II	L	3	0	0	0	3	3	OEC
PROFESSIONAL ELECTIVE										
4		Professional Elective- IV	L	3	0	0	0	3	3	PEC
5		Professional Elective- V	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		Clinical Engineering Laboratory	P	0	0	4	0	4	2	PCC
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	00	06	04	28	21	

L- Lecture   T- Tutorial   P- Practical   J- Project   TCP- Total Contact Periods
C- Credits   CAT- Category
* Common to all branches
** Common to all branches, selection from one minor vertical/approved honors subjects

SEMESTER VIII

S.No	COURSE CODE	COURSE TITLE	MODE	PERIODS PER WEEK				TCP	C	CAT
				L	T	P	J			
THEORY COURSES - PROFESSIONAL ELECTIVE										
1		Professional Elective- VI	L	3	0	0	0	3	3	PEC
ENROLLMENT FOR B.E. / B.TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)										
2		Minor/Honour/remedial class **	L	3	0	0	0	3	3**	PEC**
PRACTICAL COURSES - EMPLOYABILITY ENHANCEMENT COURSE										
3	22BMJ801	Project Work - Phase	J	0	0	0	16	16	08	EEC
			TOTAL	06	00	00	16	22	11	

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

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

CREDIT DISTRIBUTION

Semester	HSMC	BSC	ESC	PCC	PEC	OEC	EEC	MC	TOTAL	Total PER %
I	05	12	05	-	-	-	03	-	25	15
II	05	04	7.5	4.5	-	-	02	-	25	15
III	02	04	05	09	-	-	01	-	21	13
IV	-	-	02	18	-	-	01	-	21	13
V	03	-	-	13	03	-	01	-	20	12
VI	-	-	-	9	06	03	02	-	20	12
VII	-	-	-	09	06	03	03	-	21	13
VIII	-	-	-	-	03	-	08	-	11	7
TOTAL	15	20	19.5	62.5	18	06	21	-	162	100

CATEGORY		Breakup of Credits	PER % in Total
HSMC	Humanities & Social Science Including Management	15	09
BSC	Basic Science Courses	20	12
ESC	Engineering Science Courses	19.5	12
PCC	Professional Core Courses	62.5	39
PEC	Professional Elective Courses	18	11
OEC	Open Elective Courses	06	4
EEC	Employment Enhancement Courses	21	13
MCC	Mandatory Courses	-	-
Total Credits		162	100

PROFESSIONAL ELECTIVES COURSES: VERTICALS

Vertical I Bio Engineering	Vertical II Medical Devices Innovation And Development	Vertical III Management (Healthcare)	Vertical IV Mechanics	Vertical V Signal and Image Processing	Vertical VI Communication	Vertical VII Advanced Devices
Medical Physics	Foundation Skill in Integrated Product Development	Hospital Planningand Management	Bio Mechanicsand Bio Fluidics	Computer Vision	Communication Systems	Bio-MEMs andBio-NEMs
Biomedical Optics and Photonics	Medical DeviceDesign	Medical Waste Management	Cellular and Molecular Biology	Speech and audioSignal Processing	WearableDevices	Critical Care Equipment
Biomaterials and Artificial Organs	Medical Ethics and Standards	Forensic Science in Healthcare	Rehabilitation Engineering	Advanced Neural Computing	Medical Informatics	Human AssistDevice
Principles of Tissue Engineering	Medical Devices Regulations	Biomedical Engineer Role in Disaster Management	Physiological Modelling	Brain Computer Interface andApplication	Body AreaNetwork	Advancement in Healthcare Technology
Neural Engineering	Rapid Prototyping	Bio Statistics	Ergonomics	Soft computing and optimization Techniques	Telehealth Technology	Robotics InMedicine
Genetic Engineering	Intellectual Property Rights	Healthcare Economics	Haptics	Biometric Systems	Internet Of Things in Medicine	Specialty based Equipment

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
BIO ENGINEERING

S.No.	Course Code	Course Name	L	T	P	J	Contact Hours	Credits
1	22BMPE01	Medical Physics	3	0	0	0	3	3
2	22BMPE02	Biomedical Optics and Photonics	3	0	0	0	3	3
3	22BMPE03	Biomaterials and Artificial Organs	3	0	0	0	3	3
4	22BMPE04	Principles of Tissue Engineering	3	0	0	0	3	3
5	22BMPE05	Neural Engineering	3	0	0	0	3	3
6	22BMPE06	Genetic Engineering	3	0	0	0	3	3

VERTICAL II
MEDICAL DEVICES INNOVATION AND DEVELOPMENT

S.No.	Course Code	Course Name	L	T	P	J	Contact Hours	Credits
1	22BMPE07	Foundation Skill in Integrated Product Development	3	0	0	0	3	3
2	22BMPE08	Medical Device Design	3	0	0	0	3	3
3	22BMPE09	Medical Ethics and Standards	3	0	0	0	3	3
4	22BMPE10	Medical Devices Regulations	3	0	0	0	3	3
5	22BMPE11	Rapid Prototyping	3	0	0	0	3	3
6	22BMPE12	Intellectual Property Rights	3	0	0	0	3	3

VERTICAL III
MANAGEMENT
(HEALTHCARE)

S.No.	Course Code	Course Name	L	T	P	J	Contact Hours	Credits
1	22BMPE13	Hospital Planning and Management	3	0	0	0	3	3
2	22BMPE14	Medical Waste Management	3	0	0	0	3	3
3	22BMPE15	Forensic Science in Healthcare	3	0	0	0	3	3
4	22BMPE16	Biomedical Engineer Role in Disaster Management	3	0	0	0	3	3
5	22BMPE17	Bio Statistics	3	0	0	0	3	3
6	22BMPE18	Healthcare Economics	3	0	0	0	3	3

VERTICAL IV
MECHANICS

S.No.	Course Code	Course Name	L	T	P	J	Contact Hours	Credits
1	22BMPE19	Bio Mechanics and Bio Fluidics	3	0	0	0	3	3
2	22BMPE20	Cellular and Molecular Biology	3	0	0	0	3	3
3	22BMPE21	Rehabilitation Engineering	3	0	0	0	3	3
4	22BMPE22	Physiological Modelling	3	0	0	0	3	3
5	22BMPE23	Ergonomics	3	0	0	0	3	3
6	22BMPE24	Haptics	3	0	0	0	3	3

VERTICALS V
SIGNAL AND IMAGE PROCESSING

S.No	Course Code	Course Name	L	T	P	J	Contact Hours	Credits
1	22BMPE25	Computer Vision	3	0	0	0	3	3
2	22BMPE26	Speech and audio Signal Processing	3	0	0	0	3	3
3	22BMPE27	Advanced Neural Computing	3	0	0	0	3	3
4	22BMPE28	Brain Computer Interface and Application	3	0	0	0	3	3
5	22BMPE29	Soft computing and optimization Techniques	3	0	0	0	3	3
6	22BMPE30	Biometric Systems	3	0	0	0	3	3

VERTICAL VI
COMMUNICATION

S.No.	Course Code	Course Name	L	T	P	J	Contact Hours	Credits
1	22BMPE31	Communication Systems	3	0	0	0	3	3
2	22BMPE32	Wearable Devices	3	0	0	0	3	3
3	22BMPE33	Medical Informatics	3	0	0	0	3	3
4	22BMPE34	Body Area Network	3	0	0	0	3	3
5	22BMPE35	Telehealth Technology	3	0	0	0	3	3
6	22BMPE36	Internet of Things In Medicine	3	0	0	0	3	3

VERTICAL VII
ADVANCED DEVICES

S.No.	Course Code	Course Name	L	T	P	J	Contact Hours	Credits
1	22BMPE37	Bio-MEMs and Bio-NEMs	3	0	0	0	3	3
2	22BMPE38	Critical Care Equipment	3	0	0	0	3	3
3	22BMPE39	Human Assist Device	3	0	0	0	3	3
4	22BMPE40	Advancement in Healthcare Technology	3	0	0	0	3	3
5	22BMPE41	Robotics In Medicine	3	0	0	0	3	3
6	22BMPE42	Specialty based Equipment	3	0	0	0	3	3

MANDATORY COURSES 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 COURSES 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	Contact Hours	Credits
1	22RAO001	Robotics	3	0	0	3	3
2	22RAO002	Selection of Materials	3	0	0	3	3
3	22RAO003	Testing of Materials	3	0	0	3	3
4	22RAO004	Marine Vehicles	3	0	0	3	3
5	22RAO005	Introduction To Nanotechnology	3	0	0	3	3
6	22RAO006	Lean Manufacturing	3	0	0	3	3
7	22ADO001	Ethics in Data Science	3	0	0	3	3
8	22ADO002	Software Testing	3	0	0	3	3
9	22ADO003	Principles of Programming Language	3	0	0	3	3
10	22ADO004	Digital Marketing	3	0	0	3	3

11	22BMO001	Biology for Engineer	3	0	0	3	3
12	22BMO002	Basic of Biomedical Instrumentation	3	0	0	3	3
13	22BMO003	Basics of Bioinformatics	3	0	0	3	3
14	22BMO004	Biomedical Nanotechnology	3	0	0	3	3
15	22ECO001	Arduino for Engineers	3	0	0	3	3
16	22ECO002	Introduction to Embedded system	3	0	0	3	3
17	22ECO003	Space Time Wireless Communication	3	0	0	3	3
18	22ECO004	Telecommunication Network Management	3	0	0	3	3
19	22CSO001	System Software	3	0	0	3	3
20	22CSO002	Computer Graphics	3	0	0	3	3
21	22CSO003	Mobile Application Development	3	0	0	3	3

OPEN ELECTIVE – II							
S.No.	Course Code	Course Name	L	T	P	Contact Hours	Credits
1	22RAO007	Fundamentals of Combustion	3	0	0	3	3
2	22RAO008	Basics in Manufacturing and Metal Cutting Process	3	0	0	3	3
3	22RAO009	Fundamentals of Planetary Remote Sensing	3	0	0	3	3
4	22RAO010	Lean Six Sigma	3	0	0	3	3
5	22RAO011	Low Cost Automation	3	0	0	3	3
6	22RAO012	Production of Automotive Components	3	0	0	3	3
7	22ADO005	Professional Ethics	3	0	0	3	3

8		Cloud Computing	3	0	0	3	3
9		Cloud Service Management	3	0	0	3	3
10		Operating System	3	0	0	3	3
11		Troubleshooting in MedicalDevices	3	0	0	3	3
12		Quality Assurance and Safety inHospitals	3	0	0	3	3
13		Medical Electronics	3	0	0	3	3
14		Assist Devices	3	0	0	3	3
15		Introduction to IndustrialEngineering	3	0	0	3	3
16		Space Engineering	3	0	0	3	3
17		Wavelet and its Applications	3	0	0	3	3
18		Introduction to Control Systems	3	0	0	3	3
19		Ubiquitous Computing	3	0	0	3	3
20		User Interface Design	3	0	0	3	3
21		Multimedia Systems	3	0	0	3	3

COURSE CODE	COURSE TITLE	L	T	P	J	C
22HST101	**PROFESSIONAL ENGLISH**	2	0	4	0	4
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

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

COURSE OUTCOME:

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

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

UNIT-1	INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION	6 HOURS

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

UNIT-2	NARRATION AND SUMMATION	6 HOURS

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

UNIT-3	DESCRIPTION OF A PROCESS / PRODUCT	6 HOURS

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

UNIT-4	CLASSIFICATION ND RECOMMENDATIONS	6 HOURS

Reading – Newspaper articles; journal reports	
Writing – Note-making; Interpretation of charts; Recommendations	
Grammar – 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 LECTURE 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 LABORATORY HOURS	**60 HOURS**

COURSE CODE	COURSE TITLE	L	T	P	J	C
22BST101	**BASIC MATHEMATICS FOR ENGINEERS**	3	2	0	0	4
		Syllabus version				**v. 1.0**

COURSE OBJECTIVES:

After studying this course, you should be able to:

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

COURSE OUTCOME:

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

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

UNIT-1	MATRICES	9+3 HOURS

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

UNIT-2	DIFFERENTIAL CALCULUS	9+3 HOURS

Representation of functions - Limit of a function- Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - 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 – Partial differentiation– Taylor's series for functions of two variables – Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.

UNIT-4	INTEGRAL CALCULUS	9+3 HOURS

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

UNIT-5	MULTIPLE INTEGRALS	9+3 HOURS

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

	TOTAL LECTURE AND TUTORIAL HOURS:	45+15 HOURS

TEXT BOOK(S):

1.	Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons,10th Edition, New Delhi, 2016.
2.	Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition , 2018.
3.	James Stewart, " Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015. [For Units II & IV - Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCE BOOKS:

1.	Anton. H, Bivens. I and Davis. S, "Calculus", Wiley, 10th Edition, 2016
2.	Bali. N., Goyal. M. andelaectr 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:

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:

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, CO_2 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.
3.	Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGraw- Hill (Indian Edition), 2017.

REFERENCE BOOKS:

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

COURSE CODE	COURSE TITLE	L	T	P	J	C
22BST103	**ENGINEERING CHEMISTRY**	**3**	**0**	**0**	**0**	**3**
		Syllabus version			**v. 1.0**	

COURSE OBJECTIVES:

1. To inculcate 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 basic concepts and applications of phase rule and composites.
4. To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.
5. To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.

COURSE OUTCOME:

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 analyze the properties of different polymers and distinguish the polymers which can be degraded and demonstrate their usefulness and composites for material selection requirements.
4. To recommend suitable fuels for engineering processes and applications.
5. To recognize different forms of energy resources and apply them for suitable applications in energy sectors.

UNIT-1	WATER AND ITS TREATMENT	9 HOURS

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

UNIT-2	NANOCHEMISTRY	9 HOURS

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

UNIT-3	POLYMERS AND COMPOSITES	9 HOURS

Definition of biodegradable polymers- Classification of biodegradable
Polymers – Advantages, conducting polymers-polyaniline, polyacetylene, recycling of e-plastic waste (waste to wealth).

Composites: Introduction: Definition & Need for composites; Constitution: Matrix materials (Polymer, matrix, metal matrix and ceramic matrix) and Reinforcement (fibre, particulates, flakes and whiskers). Properties and applications of Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.

UNIT-4	FUELS AND COMBUSTION	9 HOURS

Fuels: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel, Knocking - octane number, diesel oil-cetane number; Power alcohol and biodiesel.

Combustion of fuels: Calorific value - higher and lower calorific values, Flue gas analysis - ORSAT Method. CO_2 emission and carbon footprint.

UNIT-5	COMPUTATIONAL CHEMISTRY AND STORAGE DEVICES	9 HOURS

Computational chemistry-molecular dynamics and chemical reactivity. Cheminformatics and Green IOT in biomedical applications, Artificial intelligence and machine learning methods to predict physicochemical properties.

Batteries: a brief introduction to electrochemical cell (Daniel cell), Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion- battery; battery used in Electric vehicles; Fuel cells: H_2-O_2 fuel cell, microbial fuel cell; 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, 2018

REFERENCE BOOKS:

1.	B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book 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.
5.	O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.

COURSE CODE	COURSE TITLE	L	T	P	J	C
22EST101	**PROBLEM SOLVING AND PYTHON PROGRAMMING**	**3**	**0**	**0**	**0**	**3**
		Syllabus version			**v. 1.0**	

COURSE OBJECTIVES:

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

COURSE OUTCOME:

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
		1	0	0	0	1
22HSM101	HERITAGE OF TAMILS	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:

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:

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

REFERENCE BOOKS:

1.	Paul H .Wright, Introduction to Engineering, School of Civil and 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:

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:

The students should be able to

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

LIST OF EXPERIMENTS:

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

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python programming using simple statements and expressions (exchange the 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 LABORATORY HOURS	**60 HOURS**			

COURSE CODE	COURSE TITLE	L	T	P	J	C
22BSP101	**PHYSICS AND CHEMISTRY LABORATORY**	**0**	**0**	**4**	**0**	**2**
	PHYSICS LABORATORY (Any Seven Experiments)	**Syllabus version**			**v. 1.0**	

COURSE OBJECTIVES:

1. To learn the proper use of various kinds of physics laboratory equipment.
2. To learn how data can be collected, presented and interpreted in a clear and concisemanner.
3. To learn problem solving skills related to physics principles and interpretation of experimentaldata.
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:

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 andirregular objects.
2. Simple harmonic oscillations of cantilever.
3. non-uniform bending - Determination of Young's modulus
4. Uniform bending – Determination of Young's modulus
5. Laser- Determination of the wavelength of the laser using grating
6. Air wedge - Determination of thickness of a thin sheet/wire
7. a) Optical fibre -Determination of Numerical Aperture and acceptance angle
    b) Compact disc- Determination of width of the groove using laser.
8. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
9. Ultrasonic interferometer - determination of the velocity of sound and compressibility of liquids
10. Post office box -Determination of Band gap of a semiconductor.
11. Photoelectric effect

12. Michelson Interferometer.
13. Melde's string experiment
14. Experiment with lattice dynamics kit.

	TOTAL LABORATORY HOURS	30

COURSE CODE	COURSE TITLE	L	T	P	J	C
22BSP101	**PHYSICS AND CHEMISTRY LABORATORY**	**0**	**0**	**4**	**0**	**2**
	CHEMISTRY LABORATORY **(Any seven experiments to be conducted)**	**Syllabus version**			**v. 1.0**	

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

COURSE OUTCOME:

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

	TOTAL LABORATORY HOURS	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:

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

COURSE OUTCOME:

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

LIST OF EXPERIMENTS:

1. **MECHANICAL EQUIPMENT STUDY**

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

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

2. **ELECTRICAL EQUIPMENT STUDY**

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

3. ELECTRONIC EQUIPMENT STUDY

a) Study the elements of a smart phone.

b) Assembly and dismantle of LED TV.

c) Assembly and dismantle of computer/ laptop

4. COMPUTER PERIPHERALS STUDY

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

5. **BIOMEDICAL EQUIPMENT**

 a) Assembly and dismantle of Electrocardiogram (ECG)

 b) Assembly and dismantle of ventilator.

 c) Assembly and dismantle of Doppler Ultra sound Scanner.

TROUBLESHOOTING

Hardware Troubleshooting: Students are to be given a PC which does not boot due to proper assembly or defective peripherals and the students should be taught to identify and correct the problem.

Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition.

Internet: Web Browsers, Access of websites, Surfing the Web, Search Engines, Customization of web browsers, proxy settings, bookmarks, search toolbars, pop-up blockers. Antivirus downloads, Protection from various threats.

TOTAL LABORATORY HOURS:	**30 HOURS**

COURSE CODE	COURSE TITLE	L	T	P	J	C
22BST201	**STATISTICS AND TRANSFORMS**	**3**	**2**	**0**	**0**	**4**
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COURSE CODE	COURSE TITLE	L	T	P	J	C
22BST201	**STATISTICS AND TRANSFORMS**	**3**	**2**	**0**	**0**	**4**
		Syllabus version			**v. 1.0**	

COURSE OBJECTIVES:

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

COURSE OUTCOME:

The students will 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. Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
4. Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
5. Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

UNIT-1	**TESTING OF HYPOTHESIS**	**12 HOURS**

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

UNIT-2	**DESIGN OF EXPERIMENTS**	**12 HOURS**

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

UNIT-3	**FOURIER SERIES**	**12 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-4	FOURIER TRANSFORMS	12 HOURS

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

UNIT-5	Z — TRANSFORMS	12 HOURS

Z-transforms — Elementary properties — Inverse Z-transform (using partial fraction and residues) — Convolution theorem

	TOTAL LECTURE HOURS:	60 HOURS

TEXT BOOK(S)

1.	Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2.	Grewal B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, New Delhi, 2014.
3.	Narayanan S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.

REFERENCE BOOKS

1.	Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
2.	Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014
3.	Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics ", Tata McGraw Hill Edition, 4th Edition, 2012.
4.	Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2010
5.	Andrews, L.C and Shivamoggi, B, "Integral Transforms for Engineers" SPIE Press, 1999.
6.	Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition, Laxmi Publications Pvt. Ltd, 2014.
7.	Erwin Kreyszig, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, India, 2016.
8.	James, G., "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
9.	Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi,2016.
10.	Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill EducationPvt. Ltd, 6th Edition, New Delhi, 2012.

COURSE CODE	COURSE TITLE	L	T	P	J	C
22BMT201	**BIOSCIENCES FOR MEDICAL ENGINEERING**	3	0	0	0	3
		Syllabus version			**v. 1.0**	

COURSE OBJECTIVES:

1. To study structural and functional properties of carbohydrates, proteins, lipids and amino acids

2. To emphasize the role of these biomolecules by providing basic information on specific metabolic diseases and disorders of these biomolecules

3. Gain knowledge on the structural and functional aspects of living organisms.

4. Know the etiology and remedy in treating the pathological diseases.

COURSE OUTCOME:

The students will be able to:

1. Explain the fundamentals of biochemistry

2. Analyze structural and functional aspects of living organisms.

3. Explain the function of microscope

4. Describe methods involved in treating the pathological diseases.

UNIT-1	FUNDAMENTALS TO BIOCHEMISTRY	9 HOURS

Introduction to Biochemistry, water as a biological solvent, weak acid and bases, pH, buffers, Handerson - Hasselbalch equation, physiological buffers in living systems, Energy in living organism. Properties of water and their applications in biological systems. Introduction to Biomolecules, Biological membrane, Clinical application of Electrolytes and radioisotopes.

UNIT-2	CARBOHYDRATES, LIPIDS, PROTEIN	9 HOURS

Classification of carbohydrates - mono, di, oligo and polysaccharides. Structure, physical and chemical properties of carbohydrates - Classification of lipids- simple, compound, and derived lipids. Nomenclature of fatty acid - Structure and properties of proteins, structural organization of proteins, classification and properties of amino acids. Nucleic acid: Structural aspects – Components of DNA and RNA, Nucleosides & Nucleotides (introduction, structure & bonding), Double helical structure of DNA (Watson-Crick model), various forms of DNA.

UNIT-3	CELL DEGENERATION, REPAIR AND NEOPLASIA	9 HOURS

Cell injury - Reversible cell injury and Irreversible cell injury and Necrosis, Apoptosis, Intracellular accumulations, Pathological calcification- Dystrophic and Metastatic. cellular adaptations of growth and differentiation, Inflammation and Repair including fracture healing, Neoplasia, Classification, Benign and Malignant tumours, carcinogenesis, spread of tumours Autopsy and biopsy.

UNIT-4	FLUID AND HEMODYNAMIC DERANGEMENTS	9 HOURS

Edema, Hyperemia/Ischemia, normal hemostasis, thrombosis, disseminated intravascular coagulation, embolism, infarction, shock, Chronic venous congestion. Hematological disorders- Bleeding disorders, Leukaemias, Lymphomas Haemorrhage.

UNIT-5	FUNDAMENTALS OF MICROBIOLOGY AND IMMUNOPATHOLOGY	9 HOURS

Structure of Bacteria and Virus - Morphological features and structural organization of bacteria and virus - List of common bacterial, fungal and viral diseases of human beings.- Basics of Microscopes : Light microscope, Electron microscope (TEM & SEM). - Natural and artificial immunity, types of Hypersensitivity, antibody and cell mediated tissue injury, Immunological techniques: immune diffusion, immuno electrophoresis, RIA and ELISA, monoclonal antibodies.

	TOTAL LECTURE HOURS	45 HOURS

TEXT BOOK(S)

1.	RAFI MD "Text book of biochemistry for Medical Student" Fourth Edition, Universities Press, Orient Blackswan Private Limited - New Delhi 2021.
2.	Ramzi S Cotran, Vinay Kumar & Stanley L Robbins, "Pathologic Basis of Diseases", 10th edition: South Asia Edition Elsevier India, 2020. (Units III & IV).
3.	Ananthanarayanan & Panicker, "Microbiology" Orientblackswan, 2017 10th edition. (Units III,IV and V).

REFERENCE BOOKS

1.	Keith Wilson & John Walker, "Practical Biochemistry - Principles & Techniques", Oxford University Press, 2009.
2.	Underwood JCE: General and Systematic Pathology Churchill Livingstone, 3rd edition, 2000.
3.	Dubey RC and Maheswari DK. "A Text Book of Microbiology" Chand & Company Ltd, 2007
4.	Prescott, Harley and Klein, "Microbiology", 10th edition, McGraw Hill, 2017

COURSE CODE	COURSE TITLE	L	T	P	J	C
22EST205	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**	3	0	0	0	3
		Syllabus version			v. 1.0	

COURSE OBJECTIVES:

1. To introduce the basics of electric circuits and analysis

2. To impart knowledge in the basics of working principles and application of electrical machines

3. To introduce analog devices and their characteristics

4. To educate on the fundamental concepts of digital electronics

5. To introduce the functional elements and working of measuring instruments

COURSE OUTCOME:		

COURSE OUTCOME:

The students will be able to:

1. Compute the electric circuit parameters for simple problems

2. Explain the working principle and applications of electrical machines

3. Analyze the characteristics of analog electronic devices

4. Explain the basic concepts of digital electronics

5. Explain the operating principles of measuring instruments

UNIT-1	ELECTRICAL CIRCUITS	9 HOURS

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

UNIT-2	ELECTRICAL MACHINES	9 HOURS

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

UNIT-3	ANALOG ELECTRONICS	9 HOURS

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

UNIT-4	DIGITAL ELECTRONICS	9 HOURS

Review of number systems, binary codes, error detection and correction codes, Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps (Simple Problems only).

UNIT-5	MEASUREMENTS AND INSTRUMENTATION	9 HOURS

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

	TOTAL LECTURE HOURS:	**45 HOURS**

TEXT BOOK(S)	
1.	Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020.

2.	S.K.Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2017

REFERENCE BOOKS	
1.	Kothari DP and I.J Nagrath, "Basic Electrical Engineering", Fourth Edition, McGraw Hill Education, 2019.
2.	Thomas L. Floyd, 'Digital Fundamentals', 11th Edition, Pearson Education, 2017.
3.	Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7th edition, 2017

COURSE CODE	COURSE TITLE	L	T	P	J	C
22EST202	**ENGINEERING GRAPHICS**	**1**	**0**	**4**	**0**	**3**
		Syllabus version		**v. 1.0**		

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

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

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

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

UNIT-1	PLANE CURVES, 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 OF SOLIDS AND DEVELOPMENT SURFACES	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	**TAMILS AND TECHNOLOGY**	1	0	0	0	1
		Syllabus version			v. 1.0	

Unit-1	WEAVING AND CERAMIC TECHNOLOGY	03 hours

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

Unit-2	DESIGN AND CONSTRUCTION TECHNOLOGY	03 hours

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

Unit-3	MANUFACTURING TECHNOLOGY	03 hours

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

Unit-4	AGRICULTURE AND IRRIGATION TECHNOLOGY	03 hours

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

Unit-5	SCIENTIFIC TAMIL & TAMIL COMPUTING	03 hours

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

	Total Lecture hours:	15 hours

TEXT BOOK(S)

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

REFERENCE BOOKS

1.	Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2.	Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies.
3.	Historical Heritage of the Tamils (Dr. S. V. Subatamanian, Dr. K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4.	Studies in the History of India with Special Reference to Tamil Nadu (Dr. K.K. Pillay) (Published by: The Author)
5.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
6.	Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book

COURSE CODE	COURSE TITLE	L	T	P	J	C
22EET201	**INNOVATIONS AND DESIGN THINKING**	**2**	**0**	**0**	**0**	**2**
		Syllabus version			v. 1.0	

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

COURSE OUTCOME:

The students will 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, SystemThinking, 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.	Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 201 4.
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:

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:

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

a) Introduction to switches, fuses, indicators and lamps Basic switch board wiring with lamp, fan and

three pin socket

b) Staircase wiring

c) Fluorescent Lamp wiring with introduction to CFL and LED types.

d) Energy meter wiring and related calculations/ calibration

e) Study of Iron Box wiring and assembly

f) Study of Fan Regulator (Resistor type and Electronic type using Diac/Triac/quadrac)

g) Study of emergency lamp wiring/Water heater

GROUP – B (MECHANICAL AND ELECTRONICS)

PART III MECHANICAL ENGINEERING PRACTICES   15

WELDING WORK:

a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.

b) Practicing gas welding.

BASIC MACHINING WORK:

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

ASSEMBLY WORK:

a) Assembling a centrifugal pump. b) Assembling a household mixer. c) Assembling an air conditioner.

SHEET METAL WORK:

a) Making of a square tray

FOUNDRY WORK:

a) Demonstrating basic foundry operations

PART IV ELECTRONIC ENGINEERING PRACTICES   15

SOLDERING WORK:

a) Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:

a) Assembling and testing electronic components on a small PCB.

ELECTRONIC EQUIPMENT STUDY:

a) Study an elements of smart phone.

b) Assembly and dismantle of LED TV.

c) Assembly and dismantle of computer/ laptop

TOTAL LABORATORY HOURS:	**45 HOURS**

COURSE CODE	COURSE TITLE	L	T	P	J	C
22BMP201	**BIOSCIENCE FOR MEDICAL ENGINEERING LABORATORY**	**0**	**0**	**3**	**0**	**1.5**
		Syllabus version			**v. 1.0**	

COURSE OBJECTIVES:

1. Estimation and quantification of biomolecules.

2. Separation of macromolecules.

3. Use Compound microscope

4. Practice on chemical examinations, Histopathological examinations etc

COURSE OUTCOME

The student will be able to:

1. Understand the Biochemistry laboratory functional components

2. Have a sound knowledge of qualitative test of different biomolecules.

3. Understand the basics knowledge of Biochemical parameter and their interpretation in Blood sample.

4. Have a sound knowledge of separation technology of proteins and amino acids.

5. Student can perform practical experiments on staining Processes.

LIST OF EXPERIMENTS:

1. Preparation of solutions: 1) percentage solutions, 2) molar solutions, 3) normal solutions

2. Standardization of pH meter, preparation of buffers, emulsions.

3. Spectroscopy: Determination of absorption maxima (λmax) of a given solution

4. General tests for carbohydrates, proteins and lipids.

5. Identification of Blood Collection Tubes and Phlebotomy equipment

6. Preparation of serum and plasma from blood

7. Estimation of Haemoglobin and blood glucose

8. Estimation of creatinine, urea and Uric acid

9. Separation of proteins by SDS electrophoresis(Demo) and amino acids by thin layer chromatography (Demo).

10. Urine physical and chemical examination (protein, reducing substances, ketones, bilirubin

11. and blood)

12. Basic staining – Hematoxylin and eosin staining.

13. Special stains – cresyl fast Blue (CFV)- Trichrome – oil red O – PAS

14. Types of Staining : Simple stain, Gram stain

15. Study of parts of compound microscope

16. Study of Histopathological slides of benign and malignant tumours.

17. Study of Haematology slides of anemia and leukemia.

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS:
Requirement for a batch of 30 students
1. Colorimeter 2 Nos

2. Spectrophotometer 1 No.

3. pH meter 1 No

4. Weighing balance 1 No

5. Refrigerator 1 No

6. SDS gel electrophoresis 1 No TLC, ready TLC plates 1 No

7. Wintrobe's tube 2 Nos.

8. Centrifuge Normal 1 No

9. Microslides 2 packets

10. Lancet 5 boxes

11. Microscope 1 No

12. Neubaur's Chamber 2 Nos.

13. Heparinized Syringe 1box Haemoglobinometer 1 No

14. Capillary tubes 1 box

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. 1.0**	

COURSE OBJECTIVES:
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 workplace

COURSE OUTCOME:
1. To communicate fluently in professional situations
2. To express flexibility and appropriacy on Technical Events
3. To demonstrate complex forms and sentence structures with adequate vocabulary
4. To report events and the processes of technological & Industrial firms.
5. To present effective Profile in 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

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	

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 and report

7. Short talk on technical topics
8. Writing recommendations
9. Visual Presentation/ Visume
10. Profile writing

	TOTAL LABORATORY HOURS	**30 HOURS**

COURSE CODE	COURSE TITLE	L	T	P	J	C
22LET202	**FRENCH LANGUAGE**	**3**	**0**	**2**	**0**	**4**
		Syllabus version			**v. 1.0**	

COURSE OBJECTIVES:

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

COURSE OUTCOME:

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

UNIT-1	PARTS OF SPEECH	12 HOURS

1. inviter et répondre à une invitation, Pronoms sujets 2. L'article définis, l'article indéfinis 3. Conjugation : présent, adjectifs possessifs 4. interrogation, décrire les personnes 5. La vie de quatre parisiens de professions différentes

UNIT-2	ELEMENTS OF GRAMMAR:	12 HOURS

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

UNIT-3	SENTENCE STRUCTURE:	12 HOURS

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

UNIT-4	TENSES AND NUMBERS	12 HOURS

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

UNIT-5	DISCOURSE	12 HOURS

1. le discours rapporté, décrire un lieu, exprimer ses préférences 2. décrire la carrière, discuter d''système éducation de France 3. parler de la technologie de l''information

	TOTAL LECTURE HOURS:	60 HOURS

TEXT BOOK(S)

1.	Christine Andant étal "À propos (livre de l'élève", LANGER., NEW DELHI,2012
2.	Myrna Bell Rochester "Easy French Step By Step", MCGraw Hill Companies., USA, 2008

REFERENCE BOOKS

1.	Michael D. Oates "Entre Amis: An Interactive Approach", 5 th Edition, Houghton Mifflin., 2005
2.	Bette Hirsch, Chantal Thompson "Moments Literaries : An Anthology for intermediate French"
3.	Simone Renaud, Dominique van Hooff "En bonne forme

COURSE CODE	COURSE TITLE	L	T	P	J	C
22LET203	**GERMAN LANGUAGE**	**3**	**0**	**2**	**0**	**4**
		Syllabus version			**v. 1.0**	

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

COURSE OUTCOME:
1. Read and write technical basic German language parts of speech
2. Speak appropriately learner's ability to learn the German language grammar.
3. Listen and comprehend lectures learner's ability to understand the 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. 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", Hueber Verlag., Germany, 2012

REFERENCE BOOKS

1.	Stefanie Dengler "Netzwerk A1", Klett-Langenscheidt Gmbh., München, 2013
2.	Hermann Funk, Christina Kuhn "Studio d A1", Goyal Publishers & Distributors Pvt. Ltd., New Delhi, 2009
3.	Rosa-Maria Dallapiazza "Tangram Aktuell 1 (Deutsch als Fremdsprache)", Max Hueber Verlag., Munchen, 2004
4.	Christiane Lemcke und Lutz Rohrmann ""Grammatik Intensivtrainer A 1", Goyal Publishers & Distributors Pvt. Ltd., New Delhi, 2012

COURSE CODE	COURSE TITLE	L	T	P	J	C
22LET204	**JAPANESE LANGUAGE**	**3**	**0**	**2**	**0**	**4**
		Syllabus version				**v. 1.0**

COURSE OBJECTIVES:

1. To acquire an understanding of basic Japanese language parts of speech
2. To facilitate learner's ability to learn the Japanese language grammar.
3. To nurture learner's ability to understand the sentence structure

	4.	To foster technical writing skills through tenses and numbers
	5.	To comprehend various lectures and talks

COURSE OUTCOME:

1. Read and write technical basic Japanese language parts of speech
2. Speak appropriately learner's ability to learn the Japanese language grammar.
3. Listen and comprehend lectures learner's ability to understand the 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 (te kudasai)
4. Present continuous tenses (te imasu) - Shall I? (～ mashou ka) - Describing a natural phenomenon (It is raining) (12)

UNIT-4	**DIFFERENT USAGES OF ADJECTIVES**	**12 HOURS**

1. Comparison -Likes and dislikes -Going to a trip- Need and desire (ga hoshii) -Wanting to…(Tabeti desu)- Going for a certain purpose (mi -ni ikimasu)
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.	Eri Banno et.al "Genki I: An Integrated Course in Elementary Japanese I -Workbook", ., 1999

2.	Tae Kim "A Guide to Japanese Grammar: A Japanese Approach to Learning Japanese Grammar", 2014	
3.	Minna No Nihongo "Translation & Grammatical Notes In English Elementary",	

SEMESTER-III

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

COURSE OBJECTIVES:

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:

The students 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

UNIT-1	PROBABILITY AND RANDOM VARIABLES	9+3 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	9+3 HOURS

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables

UNIT-3	RANDOM PROCESSES	9+3 HOURS

Classification – Stationary process – Markov process – Markov chain – Poisson process

UNIT-4	CORRELATION AND SPECTRAL DENSITIES	9+3 HOURS

Auto correlation functions – Cross correlation functions – Properties – Power spectral density – Cross spectral density – Properties.

UNIT-5	LINEAR SYSTEMS WITH RANDOM INPUTS	9+3 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	45+15 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 McGrawHill, 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, RandomVariables 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.

COURSE CODE	COURSE TITLE	L	T	P	J	C
22EST302	**ELECTRIC AND ELECTRONIC CIRCUITS**	3	0	0	0	3
		Syllabus version				**v. 1.0**

COURSE OBJECTIVES:

1. To learn various Network theorems for analyzing electrical circuits
2. To learn the principles of transient response and resonance circuits
3. To understand the construction and operation of pn junction and zener diodes.
4. To explain the operation and application of BJT and MOSFET
5. To know the operation of power amplifiers, feedback amplifiers and oscillators.

COURSE OUTCOME:

The student should be able to:

1. Implement and evaluate the concepts of network theorems in simplifying electric circuits
2. Implement and evaluate the concepts of transient response and resonance electric circuits
3. Understand the operation, characteristics, parameters and specifications of semiconductor diodes
4. Understand the construction, operation, characteristics and configurations of BJT and MOSFET.
5. Understand the construction and operation of power amplifier, feedback amplifier and oscillator.

UNIT-1	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-2	TRANSIENTS AND RESONANCE IN RLC CIRCUITS	9 HOURS

Series and parallel resonance – Frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Singly tuned circuits. Transient response of RL, RC and RLC Circuits for DC input and A.C. with sinusoidal input

UNIT-3	SEMICONDUCTOR DEVICES	9 HOURS

PN junction diode, Current equations, Diffusion and drift current densities, forward and reverse bias characteristics, Switching Characteristics -Zener diode, Construction, working and application.

UNIT-4	TRANSISTORS	9 HOURS

NPN - PNP – Junctions - Early effect - Current equations – Input and Output characteristics of CE and CC - Construction and operation of MOSFET, Comparison of N-channel and P-channel MOSFETs– Comparison of MOSFET with BJT –Applications of MOSFET

UNIT-5	POWER AMPLIFIERS AND OSCILLATORS	9 HOURS

Power amplifiers- class A-Class B-Class AB-Class C amplifiers- Types of Feedback amplifiers. Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.

	TOTAL LECTURE HOURS:	45 HOURS

TEXT BOOK(S)

1.	Hayt Jack Kemmerly, Steven Durbin, "Engineering Circuit Analysis", Mc Graw Hill education, 9th Edition, 2018.
2.	Salivahanan. S, Suresh Kumar. N, "Electronic Devices and circuits", 4th Edition, McGraw Hill, 2016.

REFERENCE BOOKS

1.	Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory" Pearson Prentice Hall, 11th Edition, 2014.
2.	David A. Bell, "Electronic Devices and Circuits", 5th Edition, Oxford University Press, 2008.
3.	Allan H.Robbins, Wilhelm C.Miller, "Circuit Analysis Theory and Practice", Cengage Learning, Fifth Edition, 1st Indian Reprint 2013.

COURSE CODE	COURSE TITLE	L	T	P	J	C
22BMT301	**BIOMEDICAL SENSORS AND TRANSDUCERS**	3	0	0	0	3
		Syllabus version				**v. 1.0**

COURSE OBJECTIVES:

1. To understand the purpose of measurement, the methods of measurements, errors associated with measurements.
2. To know the principle of transduction, classifications and the characteristics of different transducers
3. To learn the different bridges for measurement
4. To understand various type of biosensors.

COURSE OUTCOME:

The student should be able to:

1. Measure various electrical parameters with accuracy, precision, resolution.
2. Select appropriate passive or active transducers for measurement of physical phenomenon.
3. Select appropriate light sensors for measurement of physical phenomenon
4. Use AC and DC bridges for relevant parameter measurement.
5. Understand Different types of Biosensors

UNIT-1	MEASUREMENT SYSTEM	9 HOURS

Measurement System – Instrumentation - Classification and Characteristics of Transducers - Static and Dynamic - Errors in Measurements and their statistical analysis- methods of error analysis,- uncertainty analysis-expression of uncertainty: accuracy and precision index, propagation of errors- Calibration (NABL-17025) - Primary and secondary standards.

UNIT-2	DISPLACEMENT, PRESSURE, TEMPERATURE TRANSDUCER	9 HOURS

Strain Gauge: Gauge factor, sensing elements, configuration, and unbounded strain gage. Capacitive transducer - various arrangements, Inductive transducer, LVDT, Passive types: RTD materials &range, relative resistance vs. temperature characteristics, thermistor characteristics, Active type: Thermocouple - characteristics.

UNIT-3	PHOTOELECTRIC AND PIEZO ELECTRIC TRANSDUCER	9 HOURS

Phototube, scintillation counter, photo multiplier tube (PMT), photovoltaic, photo conductive cells, photo diodes, phototransistor, comparison of photoelectric transducers. Optical displacement sensors and optical encoders. Piezoelectric active transducer- Equivalent circuit and its characteristics.

UNIT-4	SIGNAL CONDITIONING CIRCUITS AND METERS	9 HOURS

Functions of signal conditioning circuits, Preamplifiers, Concepts of passive filters, Impedance matching circuits, AC and DC Bridges - wheat stone bridge, Kelvin, Maxwell, Hay, Schering, Q-meter, PMMC, MI and dynamometer type instruments - DC potentiometer- Digital voltmeter – Multi meter.

UNIT-5	ADVANCES IN SENSING TECHNOLOGIES	9 HOURS

Biosensors: Classification of biosensors, Immobilization of Bio receptor. Biocatalysts based biosensor: Principle, Construction and operation. Glucose Biosensor, Microbe Biosensor, Electrochemical Biosensor, Smart Sensors: Salient features, Architecture & Applications.

	TOTAL LECTURE HOURS:	**45 HOURS**

TEXT BOOK(S)

1.	A.K.Sawhney, "Electrical & Electronics Measurement and Instrumentation",10th edition, Dhanpat Rai & Co, New Delhi, 19th Revised edition 2011, Reprint 2014.
2.	John G. Webster, "Medical Instrumentation Application and Design", 4th edition, Wiley India Pvt Ltd, New Delhi, 2015

REFERENCE BOOKS

1.	Khandpur R.S, "Handbook of Biomedical Instrumentation", 3rd edition,Tata McGraw-Hill, New Delhi, 2014.
2.	Leslie Cromwell, "Biomedical Instrumentation and measurement", 2nd edition, Prentice hall of India, New Delhi, 2015.
3.	Albert D.Helfrick and William D. Cooper. Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, 1st edition, 2016.

COURSE CODE	COURSE TITLE	L	T	P	J	C
22BMT302	**ANATOMY AND HUMAN PHYSIOLOGY**	**3**	**0**	**2**	**0**	**4**
		Syllabus version		**v. 1.0**		

COURSE OBJECTIVES:

1. To integrate the individual functions of all the cells and tissues and organs into functional whole, the human body.
2. Function is dependent on a structure, the curriculum lays stress on functional anatomy of the organs.
3. Emphasizes on the cardiovascular, respiratory, urinary and nervous system and their interrelatedness.
4. Stimulate the students to understand the basic functioning of every system and the resultant unified organization.

COURSE OUTCOME:

The students will be able to:

1. Identify and explain basic elements of human body
2. Explain the functions of skeletal and muscular system
3. Describe the structure, function of cardiovascular system and respiratory system
4. Discuss the structure of digestive and excretory system.
5. Describe the physiological process of Nervous and sensory system

UNIT-1	BASIC ELEMENTS OF HUMAN BODY	9 HOURS

Cell - Cell Structure and organelles - Functions of each component in the cell. Cell membrane - transport across membrane - Action potential (Nernst, Goldman equation), Homeostasis. Tissue: Types, functions

UNIT-2	SKELETAL AND MUSCULAR SYSTEM	9 HOURS

Skeletal: Types of Bone and function - Physiology of Bone formation - Division of Skeleton -Types of joints and function - Types of cartilage and function. -Types of muscles - Structure and Properties of Skeletal Muscle- Changes during muscle contraction- Neuromuscular junction.

UNIT-3	CARDIOVASCULAR AND RESPIRATORY SYSTEM	9 HOURS

Cardiovascular System: Structure - Conduction System of heart - Cardiac Cycle - Cardiac output. Blood: Composition - Functions - Haemostasis - Blood groups and typing. Blood Vessels - Structure and types - Blood pressure - Respiratory system: Parts of respiratory system - Respiratory physiology Lung volumes and capacities - Gaseous exchange.

UNIT-4	DIGESTIVE AND EXCRETORY SYSTEMS	9 HOURS

Structure and functions of gastrointestinal system - secretory functions of the alimentary tract - digestion and absorption in the gastrointestinal tract - structure of nephron - mechanism of urine formation - skin and sweat gland - temperature regulation.

UNIT-5	NERVOUS AND SENSORY SYSTEM	9 HOURS

Structure and function of nervous tissue - Brain and spinal cord - Functions of CNS - Nerve conduction and synapse - Reflex action - Somatic and Autonomic Nervous system. Physiology of Vision, Hearing, Integumentary, Olfactory systems. Taste buds.

	TOTAL LECTURE HOURS	45 HOURS

TEXT BOOK(S)

1.	Elaine.N. Marieb, "Essential of Human Anatomy and Physiology", Ninth Edition, Pearson Education, New Delhi, 2018.
2.	Gopal B. Saha "Physics and Radiobiology of Nuclear Medicine", Third edition Springer, 2006. (Unit 2,3,4)

REFERENCE BOOKS

1.	Guyton & Hall, "Text book of Medical Physiology", 13th Edition, Saunders, 2015.
2.	Ranganathan T S, "Text book of Human Anatomy", S.Chand& Co. Ltd., New Delhi, 2012.
3.	SaradaSubramanyam, K MadhavanKutty, Singh H D, "Textbook of Human Physiology", S. Chand and Company Ltd, New Delhi, 2012.

LIST OF CHALLENGING EXPERIMENTS (INDICATIVE)

1.	Collection of Blood Samples
2.	Identification of Blood groups (Forward and Reverse)
3.	Bleeding and Clotting time
4.	Estimation of Hemoglobin
5.	Total RBC and WBC Count
6.	Differential count of Blood cells

7.	Estimation of ESR, PCV, MCH, MCV, MCHC
8.	Hearing test – Tuning fork
9.	Visual Activity – Snellen's Chart and Jaeger's Chart

TOTAL LABORATORY HOURS	30 HOURS

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS:
Requirement for a batch of 30 students

1. Microscope   2 Nos
2. Centrifuge Normal   1 No
3. Wintrobe's tube   2 Nos.
4. PCV tube   2 Nos
5. Neubaur's Chamber   2 Nos.
6. Heparinized Syringe   1box
7. Haemoglobinometer   1 No
8. Blood grouping kit   1 No
9. Capillary tubes   1 box
10. Ophthalmoscope   1 No
11. Tuning fork (256Hz to 512Hz)   5 Nos.
12. Microslides   2 packets
13. Lancet   5 boxes

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

COURSE OBJECTIVES:

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:

The students 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	6 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	6 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	6 HOURS

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

UNIT-4	LAUNCHING OF SMALL BUSINESS	6 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	6 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:	30 HOURS

COURSE CODE	COURSE TITLE	L	T	P	J	C
22ESP301	**ELECTRIC AND ELECTRONIC CIRCUITS LABORATORY**	0	0	4	0	2
		Syllabus version			**v. 1.0**	

COURSE OBJECTIVES:

1. To supplement the theory courses Semiconductor Devices and Basic Electrical Engineering.
2. To assist the students in obtaining a better understanding of the operation of electronic circuits and devices
3. To provide experience in analyzing network theorems.

COURSE OUTCOME:

The students will be able to:

1. Experiment and determine the VI characteristics of given PN junction diode, Zener diode, and Photo diode
2. Experiment and determine the Input & output characteristics of BJT
3. Experiment and test half wave and full wave rectifier circuit using PN Junction diode and obtain the ripple factor, rectifier efficiency and experiment and test voltage regulation characteristics using Zener diode voltage regulator circuit.
4. Experiment and test the given electric circuit using Kirchhoff's laws and obtain the mesh current & node voltage and obtain the load current for the given circuit using Superposition, Thevenin's, and Norton's and Reciprocity theorems.
5. Construct and test RLC series and parallel circuits to compute the resonant frequency and bandwidth by plotting the frequency response.

LIST OF EXPERIMENTS:

1. Characteristics of PN and zener diode.

2. Characteristics of CE, CB configurations

3. Voltage regulation using zener diode.

4. Study of characteristics of photo diodes

5. Frequency response of RLC series and parallel resonance circuits

6. Half wave and Full wave rectifier with capacitor filter

7. Verification of KVL and KCL

8. Verification of Thevenin's and Norton's Theorems.

9. Verification of superposition Theorem.

10. Verification of Maximum power transfer and reciprocity theorems.

LIST OF EQUIPMENTS:(30 STUDENTS PER BATCH)

1. DSO (50MHz)
2. DC Digital Ammeter
3. DC Digital Voltmeter
4. Function Generator (3MHz)
5. Analog IC Tester
6. Digital IC Tester
7. Digital IC Trainer Kit
8. Dual Regulated Power supply (0-30) V/2A
9. Multiple Regulated Power suppy (+5) V/2A, (015)V/2A
10. Single Regulated Power supply (0-30) V/2A
11. Decade Inductance Box (6Dial)
12. Variable Resistance Box (6Dial)
13. Decade Capacitance Box (6Dial)
14. Analog Ammeter (0-1) mA
15. Analog Voltmeter
16. Digital Multimeter

TOTAL LABORATORY HOURS:	**45 HOURS**

COURSE CODE	COURSE TITLE	L	T	P	J	C
22BMP301	**BIOMEDICAL SENSORS AND TRANSDUCERS LABORATORY**	0	0	4	0	2
		Syllabus version			**v. 1.0**	

COURSE OBJECTIVES:

1. To introduce the relevance of this course to the existing technology through demonstrations, simulations with a futuristic vision along with socio-economic impact and issues.
2. To study the characteristics of sensors, signal conditioning circuits and display devices.

COURSE OUTCOME:

The students will be able to:

1. Design and understand characteristics and calibration of various transducers.
2. Design and develop bridge circuits to find unknown variables.
3. Select proper transducer for various applications.
4. Understand various read out and display devices.
5. Design a measurement system for various applications.

LIST OF EXPERIMENTS:

1. Calibration of voltmeter and ammeter using shunt type Potentiometer
2. Characteristics of thermistor
3. Characteristics of thermocouple
4. Characteristics of LDR
5. Characteristics of Photo Diode
6. Characteristics of Photo transistor
7. Characteristics of LVDT
8. Characteristics of Strain Gauge
9. Measurement of unknown Resistance using Kelvin Double Bridge and Wheatstone bridge
10. Measurement of unknown Capacitance using Schering Bridge
11. Measurement of unknown Inductance using Maxwell's & Hay's Bridge
12. Characteristics of Hall effect transducer
13. Characteristics of RTD
14. Study on Immobilisation techniques

LAB REQUIREMENTS FOR 30 STUDENTS:

1. Thermocouple--   15 Nos

2. Strain Gauge (bonded and unbounded type)-15 each

3. Photo transister, photo diode–15 Nos each

4. Resistors-Range between 1-0.0001 ohm - 30 Nos/each

5. CRO-10

6. DSO-5

7. LVDT – 5

9. Hall effect transducer - 15 Nos

10. Piezoelectric Transducer- 15 N

	TOTAL LABORATORY HOURS	**60 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 LABORATORY 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)

COURSE CODE	COURSE TITLE	L	T	P	J	C
22BMT401	**BIO CONTROL SYSTEMS**	**3**	**0**	**0**	**0**	**3**
		Syllabus version				**v. 1.0**

COURSE OBJECTIVES:

1. To study the fundamental mathematical techniques for analysis of given system
2. To know the concepts of transient response analysis
3. To be familiar with the frequency domain analysis
4. To learn concept of the stability analysis
5. To understand the applications of physiological control system

COURSE OUTCOME:

The student should be able to:

1. Develop mathematical model for a given system.
2. Determine and analyze the time domain specifications of different systems.
3. Determine and Analyze the frequency domain specifications of the different systems
4. Perform stability analysis of the given system using various techniques
5. Explain the concept and model of physiological control systems.

UNIT-1	SYSTEM ANALYSIS- FUNDAMENTAL CONCEPTS	9 HOURS

Physiological control systems analysis - differences between engineering and physiological control systems-the science of modeling -generalized system properties models with combinations of system, elements linear models of physiological systems distributed parameter versus lumped parameter models.

UNIT-2	TRANSIENT RESPONSE ANALYSIS	9 HOURS

Linearized respiratory mechanics – open loop and closed loop transient response, first order model, second order model- descriptors of impulse and step responses, open loop versus closed loop dynamics-a model of neuromuscular reflex motion

UNIT-3	FREQUENCY RESPONSE ANALYSIS	9 HOURS

State space responses to sinusoidal inputs, graphical representation of frequency response, frequency response of a model of circulatory control frequency response of glucose – insulin

UNIT-4	STABILITY ANALYSIS	9 HOURS

Root locus plots - Routh – Hurwitz, stability criterion, Nyquist criterion for stability relative stability, stability analysis of the pupillary light-reflex model of cheyne - stokes breathing.

UNIT-5	APPLICATIONS IN PHYSIOLOGICAL CONTROL SYSTEM	9 HOURS

Basic problems, nonparametric and parametric identification-problems in parameter estimation, identification of closed loop systems, identification under closed loop conditions- optimization, single parameter-optimization constrained optimization, adaptive control.

	TOTAL LECTURE HOURS:	45 HOURS

TEXT BOOK(S)	
1.	Michael C K Khoo, "Physiological control systems", IEEE Press, Prentice Hall of India, 2005.
2.	Nagarath.J and M.Gopal, "Control System Engineering", New Age International Publishers, 6th Edition, 2008

REFERENCE BOOKS	
1.	Gopal.M., "Control System, Principles and Design", McGraw-Hill, 2012.
2.	Joseph J. DiStefano, Allen R.Stubberud, Schaum's, "Outline of Feedback and Control Systems", McGraw-Hill Education, 2nd Edition,2013
3.	Richard C.Dorf &Robert H. Bishop, "Modern Control Systems", Prentice Hall, 12th Edition, 2010.

COURSE CODE	COURSE TITLE	L	T	P	J	C
22BMT402	**SIGNAL PROCESSING**	**3**	**0**	**2**	**0**	**4**
		Syllabus version		**v. 1.0**		

COURSE OBJECTIVES:
1. To understand about the continuous time and discrete time signals and systems.
2. To learn the analysis of LTI systems using Laplace and Z transform.
3. To represent the signal in frequency domain using FFT.
4. To gain knowledge about the design of IIR and FIR filters.

COURSE OUTCOME:

The students will be able to:
1. To classify the continuous time and discrete time signals and systems.
2. To analyze the signals in both continuous time and discrete time
3. To apply DFT for the analysis of digital signals & systems
4. To design IIR filter to process real world signals.
5. To design FIR filter to process real world signals.

UNIT-1	FUNDAMENTALS OF SIGNALS AND SYSTEMS	9 HOURS

Classification of systems: Continuous, discrete, linear, causal, stability, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect.

UNIT-2	ANALYSIS OF LTI SYSTEMS	9 HOURS

Fourier Series - Fourier Transform and Properties, Analysis of Continuous Time LTI Systems - Z Transform - Properties of ROC- Inverse Z Transform - DTFT - Analysis of Discrete Time LTI Systems.

UNIT-3	DISCRETE FOURIER TRANSFORM	9 HOURS

DFT and its properties, magnitude and phase representation-Linear Convolution- Correlation-Circular Convolution, Overlap-add and overlap-save methods. FFT - Decimation in Time Algorithm, Decimation in Frequency Algorithm. Use of FFT in Linear Filtering.

UNIT-4	INFINITE IMPULSE RESPONSE FILTERS	9 HOURS

Analog filters - Butterworth filters, Chebyshev Type I filters (upto 3rd order), Analog Transformation of prototype LPF to BPF /BSF/ HPF. Transformation of analog filters into equivalent digital filters using Impulse invariant method and Bilinear Z transform method - Realization structures for IIR filters - direct, cascade and parallel forms.

UNIT-5	FINITE IMPULSE RESPONSE FILTERS AND MULTIRATE SIGNAL PROCESSING	9 HOURS

Design of linear phase FIR filters - windowing and Frequency sampling methods. Realization structures for FIR filters – Transversal and Linear phase structures, Comparison of FIR and IIR. Introduction to DSP processors. Introduction to Multirate signal Processing – Decimation and Interpolation. Applications in Biosignals- ECG,EEG and PCG.

	TOTAL LECTURE HOURS	45 HOURS

TEXT BOOK(S)

1.	Allan V.Oppenheim, S.Wilsky and S.H.Nawab, "Signals and Systems", Pearson, Indian Reprint, 2nd Edition, 2015.
2.	John G Proakis and Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Pearson, 4 th Edition, 2014

REFERENCE BOOKS

1.	S. Haykin and B. Van Veen, "Signals and Systems", Wiley, 2 nd Edition, 2007
2.	B. P. Lathi, "Principles of Linear Systems and Signals", Oxford, 2nd Edition, 2009.
3.	Emmanuel Ifeachor, Barrie Jervis, "Digital Signal Processing- A practical approach", Pearson, 2 nd Edition, 2002.

LIST OF CHALLENGING EXPERIMENTS (INDICATIVE)

1.	Construction of signals with different Frequencies.
2.	Analyse the stability of a CT System with various inputs.
3.	Reconstruct a signal from samples and study the effect of Aliasing.
4.	Analyse the stability of a DT System with various inputs.
5.	Spectrum Analysis using FFT
6.	Filter Design & Analysis.
7.	Finite word length effect.
8.	Multirate Signal Processing
9.	DSP Processor Implementation. (Linear and Convolution, FFT implementation, IIR and FIR filters implementation)
	TOTAL LABORATORY HOURS	30 HOURS

COURSE CODE	COURSE TITLE	L	T	P	J	C
22BMT403	**BIOMEDICAL INSTRUMENTATION**	**3**	**0**	**0**	**2**	**4**
		Syllabus version			**v. 1.0**	

COURSE OBJECTIVES:
1. To understand the origin of various biological signals and electrode configurations specific to bio-potential measurements.
2. To understand the characteristics of Bio signals.
3. To understand the design of bio amplifiers
4. To explain the different techniques used for measurement of non-electrical bio-parameters
5. To explain the biochemical measurement techniques as applicable for diagnosis and treatment.

COURSE OUTCOME:

The student should be able to:
1. Illustrate the origin of various biological signals and their characteristics.
2. Gain knowledge on characteristics of bio signals.
3. Gain knowledge on various amplifiers involved in monitoring and transmission of bio signals.
4. Explain the different measurement techniques for non-electrical bio-parameters
5. Explain the biochemical measurement techniques as applicable for diagnosis and further treatment.

UNIT-1	**ELECTRODE CONFIGURATIONS**	**9 HOURS**

Origin of bio potential and its propagation. Electrode configurations: Electrode-electrolyte interface, electrode-skin interface impedance, polarization effects of electrode - non-polarizable electrodes. Unipolar and bipolar configuration, classification of electrodes

UNIT-2	**BIOSIGNAL CHARACTERISTICS**	**9 HOURS**

Bio signals characteristics - ECG-frequency and amplitude ranges - Einthoven's triangle, standard 12 lead system. EEG - EEG - 10-20 electrode system, unipolar, bipolar and average mode. EMG- unipolar and bipolar mode. EMG - Electrode configuration -unipolar and bipolar mode.

UNIT-3	**BIOAMPLIFIERS**	**9 HOURS**

Need for bio-amplifier - Differential bio-amplifier - Single ended amplifier - Band pass filtering, isolation amplifiers - transformer and optical isolation - isolated DC amplifier and AC carrier amplifier. Chopper amplifier. Power line interference

UNIT-4	**MEASUREMENT OF BIO SIGNALS**	**9 HOURS**

Temperature, respiration rate and pulse rate measurements. Blood Pressure - indirect methods: auscultatory method, oscillometric method, direct methods: electronic manometer, Pressure amplifiers systolic, diastolic, mean detector circuit. Blood flow and cardiac output measurement: Indicator dilution, thermal dilution and dye dilution method, Electromagnetic and ultrasound blood flow measurements

UNIT-5	BIOCHEMICAL MEASUREMENTS	9 HOURS

Biochemical sensors - pH, pO2 and pCO2, Ion selective Field effect Transistor (ISFET), Immunologically sensitive FET (IMFET), Blood glucose sensors. Blood gas analyzers, colorimeter, flame photometer, spectrophotometer, blood cell counter, auto analyzer.

	TOTAL LECTURE HOURS	45 HOURS

TEXT BOOK(S)

1.	Leslie Cromwell, "Biomedical Instrumentation and measurement", 2nd edition, Prentice hall of India, New Delhi, 2015.
2.	John G. Webster, "Medical Instrumentation Application and Design", 4th edition, Wiley India Pvt Ltd, New Delhi, 2015.

REFERENCE BOOKS

1.	Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw Hill, New Delhi, 2003.
2.	John Enderle, Susan Blanchard, Joseph Bronzino, "Introduction to Biomedical Engineering", second edition, Academic Press,2005.
3.	Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson Education, 2004.

LIST OF PROJECTS

1.	Heart-Beat Monitoring
2.	Patients BP level Monitoring
3.	Blood flow measurement
4.	Respiration Rate Measurement Using Piezoelectric Sensor
5.	Temperature Detector

	TOTAL LABORATORY HOURS	30 HOURS

COURSE CODE	COURSE TITLE	L	T	P	J	C
22BMT404	**ANALOG AND DIGITAL INTEGRATED CIRCUITS**	3	0	0	0	3
		Syllabus version				v. 1.0

COURSE OBJECTIVES:

1. To study the circuit configuration and introduce practical applications of linear integrated circuits.
2. To introduce the concept of application of ADC and DAC in real time systems and Phase Locked Loop with applications.
3. To introduce the design of various combinational digital circuits using logic gates
4. To bring out the analysis and design procedures for synchronous and asynchronous sequential circuits

COURSE OUTCOME:

The student should be able to:
1. Design new analog linear circuits and develop linear IC based Systems.
2. Apply the concept of ADC and DAC in real time systems and Phase Locked Loop with applications.
3. Use Boolean algebra and apply it to digital systems.
4. Design various combinational digital circuits using logic gates.
5. Bring out the analysis and design procedures for synchronous and asynchronous sequential circuits

UNIT-1	INTRODUCTION TO OPERATIONAL AMPLIFIER AND ITS APPLICATIONS	9 HOURS

Operational amplifier -ideal characteristics, Performance Parameters, Linear and Nonlinear Circuits and their analysis- voltage follower, Inverting amplifier, Non-inverting Amplifiers, Differentiator, Integrator, Voltage to Current converter, Instrumentation amplifier, Low pass, High pass filter and band pass filters, Comparator, Multivibrator and Schmitt trigger, Triangular wave generator.

UNIT-2	DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS AND PLL	9 HOURS

Analog switches, High speed sample and hold circuit and IC's, Types of D/A converter -Weighted resistor, R-2R ladder DAC, D/A Accuracy and Resolution. A/D converter - Flash, Dual slope, Successive approximation, A/D Accuracy and Resolution. Voltage controlled oscillator, Voltage to Frequency converters. PLL-Closed loop analysis of PLL, Frequency multiplication/ division, FSK demodulator.

UNIT-3	THE BASIC GATES ANDCOMBINATIONAL LOGIC CIRCUITS	9 HOURS

Number Systems - Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes - Binary, BCD, 84-2-1, 2421, Excess 3, Biquinary, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map and Tabulation methods. Logic families- TTL, MOS, CMOS, BiCMOS - Comparison of Logic families

UNIT-4	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-5	SEQUENTIAL LOGIC CIRCUITS	9 HOURS

Flip flops - SR, JK, T, D, Master/Slave FF, Triggering of FF, Analysis and design of clocked sequential circuits - state minimization, state assignment, circuit implementation. Counters, Ripple Counters, Ring Counters. Types of Registers, Serial In - Serial Out, Serial In - Parallel out, Parallel In -Serial Out, Parallel In - Parallel Out, Universal Shift Register.

	TOTAL LECTURE HOURS:	45 HOURS

TEXT BOOK(S)

1.	Sergio Franco, "Design with operational amplifiers and analog integrated circuits", Mc Graw Hill Education, 3rd Edition, 2017
2.	John.F.Wakerly, "Digital design principles and practices", Pearson Education, 5th Edition, 2018

REFERENCE BOOKS	
1.	Charles H.Roth, Jr, "Fundamentals of Logic Design", Jaico Books, 7th Edition, 2013.
2.	M. Morris Mano and Michael D.Ciletti, "Digital Design", Pearson, 5th Edition, 2013.
3.	S Salivahanan and V S Kanchana Bhaaskaran, Linear Integrated Circuits, McGraw Hill Education, 3rd Edition, 2018

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:

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:

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 has lead 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	30 HOURS

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

COURSE CODE	COURSE TITLE	L	T	P	J	C
22BMP401	**BIOMEDICAL INSTRUMENTATION LABORATORY**	0	0	4	0	2
		Syllabus version				**v. 1.0**

COURSE OBJECTIVES:

1. To study and design Bio amplifiers.
2. To provide hands on training on Measurement of physiological parameters.

COURSE OUTCOME:

The student should be able to:

1. Design the amplifier for Bio signal measurements
2. Measure heart rate and heart sounds
3. Record and analyze pulse rate and respiration rate
4. Measure blood pressure and blood flow
5. Design isolation amplifier

LIST OF EXPERIMENTS:

1. Design of pre amplifiers to acquire bio signals along with impedance matching circuit using suitable IC's
2. Design of ECG Amplifiers with appropriate filter to remove power line and other artifacts.
3. Design of EMG amplifier
4. Design a suitable circuit to detect QRS complex and measure heart rate
5. Design of frontal EEG amplifier
6. Design of EOG amplifier to detect eye blink
7. Design a right leg driven ECG amplifier.
8. Design and study the characteristics of optical Isolation amplifier
9. Design a Multiplexer and Demultiplexer for any two biosignals.
10. Measurement of pulse-rate using Photo transducer.
11. Measurement of pH and conductivity.
12. Measurement of blood pressure using sphygmomanometer.
13. Measurement and recording of peripheral blood flow
14. Design a PCB layout for any bio amplifier using suitable software tool.

LIST OF EQUIPMENT:(30 Students per Batch)

1. pH meter and conductivity meter: 1 No.
2. Photo transducer for pulse measurement: 1 No.
3. Sphygmomanometer and Stethoscope: 1 No.
4. Blood flow measurement system: 1 No.
5. Multiparameter (ECG, EMG, EEG) Simulator: 2 No.
6. Function generator, DSO, Regulated Power supplies, Bread boards – 8 each
7. IC LM 324, AD 620, INA series (126,128 etc.), 555 Timer: 20 each
8. Opto Isolator IC: MCT2E – 1 No.
9. Software tool for PCB design: 1

	TOTAL LABORATORY HOURS	60 HOURS

COURSE CODE	COURSE TITLE	L	T	P	J	C
22BMP402	**ANALOG AND DIGITAL INTEGRATED CIRCUITS LABORATORY**	0	0	4	0	2
		Syllabus version			**v. 1.0**	

COURSE OBJECTIVES:

1. To design digital logic and circuits
2. To learn the function of different ICs
3. To understand the applications of operation amplifier.
4. To learn the working of multivibrators
5. To design circuits for generating waveforms using ICs.

COURSE OUTCOME:

The students will be able to:

1. Design Combinational Circuits using logic gates
2. Design and implement arithmetic circuits for different applications using opamp
3. Design Sequential Circuits using logic gates
4. Design wave form generators and analyse their characteristics
5. Simulate and analyse circuits using ICs

LIST OF EXPERIMENTS:

1. Inverting, non-inverting amplifier and comparator
2. Integrator and Differentiator
3. Design and analysis of active filters using opamp
4. Schmitt trigger using operational amplifier
5. Instrumentation amplifier using operational amplifier
6. RC and LC oscillators
7. Multivibrators using IC555 Timer
8. Study of logic gates, Half adder and Full adder
9. Encoder and BCD to 7 segment decoder
10. Multiplexer and demultiplexer using digital ICs
11. Universal shift register using flip flops
12. Design of mod-N counter
13. Simulation and analysis of circuits using software

LIST OF EQUIPMENT:(30 Students per Batch)

1. CRO/DSO (30MHz) – 15 Nos.
2. Signal Generator /Function Generators (3 MHz) – 15 Nos
3. Dual Regulated Power Supplies (0 – 30V) – 15 Nos.
4. Standalone desktop PCs with SPICE software - 15 Nos.
5. Transistor/FET (BJT-NPN-PNP and NMOS/PMOS) – 50 Nos
6. Components and Accessories: Resistors, Capacitors, Inductors, diodes, Zener Diodes, Bread Boards, Transformers.
7. SPICE Circuit Simulation Software: (any public domain or commercial software)

TOTAL LABORATORY HOURS	**60 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:

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:

Students Able to

1. solve quantitative aptitude problems and questions applying logical reasoning, within a short time span given during the placement drives

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**