AMITY SCHOOL OF ENGINEERING AND TECHNOLOGY (ASET)

**Bachelor of Technology
in
Mechatronics
Engineering (BMT)**

Programme Code:

121451

Duration – 4 Years Full Time

(Programme Structure)

Choice Based Credit System (CBCS)

2021

AMITY UNIVERSITY RAJASTHAN

Program Learning Outcomes – PLO

- Students will be able to apply knowledge of mathematics, science, engineering, and technology to engineering technology problems that equire the application of principles and applied procedures or methodologies.
- Students will be able to use current techniques, skills, and modern tools of mechatronics engineering technology to broadly defined engineering technology activities including proficiency in mechanical design, materials, manufacturing processes, and automation.
- Students will be able to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes.
- Students will be able to demonstrate an ability to design systems, components, or processes for broadly defined engineering technology problems.
- Students will be able to analyze the impact of engineering technology solutions in a societal and global context.
- Students will be able to manage projects related to Mechatronics Engineering in multidisciplinary environments.

Credits Summary

B.Tech-Mechatronics (Bachelor of Technology) (04 Years/ 08 Semesters)						
Semester	Core Course (CC+PC)	Domain Electives (DE)	Value Added Course (VAC)	Open Electives (OE)	Non-Teaching Credit Courses (NTCC)	Total
I	24	-	4	-	-	28
II	25	-	4	3	-	32
III	19	3	4	3		29
IV	18	3	4	3		28
V	11	3	4	3	5	26
VI	19	3	4	3		29
VII	09	3	4	-	6	22
VIII	15	3	-	-		18
Total	140	18	28	15	11	212

CC	=	Core Course
DE	=	Domain Elective
OE	=	Open Elective
VA	=	Value Added Course
NTCC	=	Non - Teaching Credit Courses (NTCC)

AMITY SCHOOL OF ENGINEERING TECHNOLOGY (ASET)

Program Name: B.Tech. – MECHATRONICS ENGINEERING

FIRST SEMESTER

Code	Title	Category	L	T	P	Credit
Core Courses						
AM101	Applied Mathematics – I	CC	3	1	-	4
AP 102	Applied Physics-I – Fields & Waves	CC	2	1	-	3
AC 203	Applied Chemistry	CC	2	1	-	3
BME 205	Elements of Mechanical Engineering	CC	2	1	-	3
BCS 104	Introduction to Computers & Programming in C	CC	2	1	-	3
BEE 105	Basics of Electrical and Electronics Engineering	CC	2	1	-	3
Practical Courses						
AP 122	Applied Physics-I – Fields & Waves Lab	PC	-	-	2	1
AC 223	Applied Chemistry Lab	PC	-	-	2	1
BME 225	Elements of Mechanical Engineering Lab	PC	-	-	2	1
BCS 124	Programming in C Lab	PC	-	-	2	1
BEE 125	Basics of Electrical and Electronics Engineering Lab	PC	-	-	2	1
Value Added Courses						
BCS 101	English	VA	1	-	-	1
BSS 104	Behavioral Science-I Understanding Self For Effectiveness- I	VA	1	-	-	1
	Foreign Language - I	VA	2	-	-	2
FLT 101	French					
FLG 101	German					
FLS 101	Spanish					
FLC 101	Chinese					
TOTAL						**28**

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Program Name: B.Tech. – MECHATRONICS ENGINEERING

SECOND SEMESTER

Code	Title	Category	L	T	P	Credit
Core Courses						
AM 201	Applied Mathematics – II	CC	3	1	-	4
AP 202	Applied Physics-II – Modern Physics	CC	2	1	-	3
BCS 203	Object Oriented Programming using C^{++}	CC	2	1	-	3
BME 204	Engineering Mechanics	CC	2	1	-	3
BME 205	Engineering Graphics	CC	1	-	-	1
BMT 205	Introduction to Engineering and Design	CC	2	-	-	2
EVS 001	Environment Studies	CC	3	1	-	4
BMT 206	Domain Workshop	CC	1	-	-	1
Practical Courses						
AP 222	Applied Physics-II – Modern Physics Lab	PC	-	-	2	1
BCS 223	Object Oriented Programming using C^{++} Lab	PC	-	-	2	1
BME 224	Engineering Mechanics Lab	PC	-	-	2	1
BME 225	Engineering Graphics Lab	PC	-	-	2	1
						25
Open Elective						
	Open Elective-1	OE	3	-	-	3
Value Added Courses						
BCS 201	English	VA	1	-	-	1
BSS 204	Behavioral Science – II Problem Solving & Creative Thinking	VA	1	-	-	1
	Foreign Language – II	VA	2	-	-	2
FLT 201	French					
FLG 201	German					
FLS 201	Spanish					
FLC 201	Chinese					
TOTAL						**32**

AMITY SCHOOL OF ENGINEERING TECHNOLOGY (ASET)

Program Name: B.Tech. – MECHATRONICS ENGINEERING

THIRD SEMESTER

Code	Title	Category	L	T	P	Credit
Core Courses						
BMT 301	Numerical Analysis & Programming	CC	3	-	-	3
BMT 302	Mechanics of Machine	CC	2	1	-	3
BMT 303	Manufacturing Processes	CC	2	1	-	3
BMT 304	Introduction to Automation	CC	3	-	-	3
BMT 305	Microprocessor-I	CC	2	-	-	2
Practical Courses						
BMT 321	Numerical Analysis & Programming Lab	PC	-	-	2	1
BMT 322	Mechanics of Machine lab	PC	-	-	2	1
BMT 323	Manufacturing Processes Lab	PC	-	-	2	1
BMT 324	Computer Aided Drafting & Design Lab	PC	-	-	2	1
BMT 325	Microprocessor-I Lab	PC	-	-	2	1
						19
DE Electives 1: Student has to select 1 course from the list of following DE electives						
BMT 307	Alternative Source of Energy	DE	3	-	-	
BMT 308	Computer Graphics	DE	3	-	-	3
BMT 309	Electronic Devices and Circuits	DE	3	-	-	
Open Elective						
	Open Elective-2	OE	3	-	-	3
Value Added Courses						
BCS 301	Communication Skills – I	VA	1	-	-	1
BSS 304	Behavioral Science-III, Interpersonal Communication	VA	1	-	-	1
	Foreign Language - III	VA	2	-	-	2
FLT 301	French					
FLG 301	German					
FLS 301	Spanish					
FLC 301	Chinese					
TOTAL						**29**

AMITY SCHOOL OF ENGINEERING TECHNOLOGY (ASET)

Program Name: B.Tech. – MECHATRONICS ENGINEERING FOURTH SEMESTER

Code	Title	Category	L	T	P	Credit
Core Courses						
BMT 401	Applied Thermodynamics	CC	3	-	-	3
BMT 402	Fluid Mechanics	CC	2	1	-	3
BMT 403	Metrology	CC	3	-	-	3
BMT 404	Introduction to Smart Materials	CC	2	-	-	2
BMT 405	Microprocessor-II	CC	2	-	-	2
Practical Courses						
BMT 421	Thermodynamics Lab	PC	-	-	2	1
BMT 422	Fluid Mechanics Lab	PC	-	-	2	1
BMT 423	Metrology Lab	PC	-	-	2	1
BMT 424	Measurement and Control Lab	PC	-	-	2	1
BMT 425	Microprocessor System Lab	PC	-	-	2	1
						18
DE Electives 2: Student has to select 1 course from the list of following DE electives						
BMT 406	Materials Science and Metallurgy	DE	3	-	-	
BMT 407	Quality Control & Quality Assurance	DE	3	-	-	
BMT 408	Artificial Intelligence & Robotics	DE	3	-	-	3
Open Elective						
	Open Elective-3	OE	3	-	-	3
Value Added Courses						
BCS 401	Communication Skills - II	VA	1	-	-	1
BSS 404	Behavioral Science – IV, Relationship Management	VA	1	-	-	1
FLT 401 FLG 401 FLS 401 FLC 401	Foreign Language - IV French German Spanish Chinese	VA	2	-	-	2
TOTAL						**28**

INDUSTRIAL TRAINING – I: 6-8 Weeks

AMITY SCHOOL OF ENGINEERING TECHNOLOGY (ASET)

Program Name: B.Tech. – MECHATRONICS ENGINEERING FIFTH SEMESTER

Code	Title	Category	L	T	P	Credit
Core Courses						
BMT 501	Machine Design – I	CC	3	-	-	3
BMT 502	Design of Mechatronics System	CC	3	-	-	3
BMT 503	Heat & Mass Transfer	CC	2	-	-	2
Practical Courses						
BMT 521	Heat & Mass Transfer Lab	CC	-	-	2	1
BMT 522	Design of Mechatronics System Lab	CC	-	-	2	1
BMT 523	Practical Training (Evaluation)	NTCC	-	-	-	6
						16
DE Electives 3: Student has to select 1 course from the list of following DE electives						
BMT 505	Advanced Manufacturing Process	DE	3	-	-	
BMT 506	Metal Cutting & Tool Design	DE	3	-	-	
BMT 507	Management of Manufacturing Systems	DE	3	-	-	3
BMT 508	Embedded System	DE	3	-	-	
Open Elective						
	Open Elective-4	OE	3	-	-	3
Value Added Courses						
BCS 501	Communication Skills - III	VA	1	-	-	1
BSS 504	Behavioral Science –V Group Dynamics & Team Building	VA	1	-	-	1
	Foreign Language – V	VA	2	-	-	2
FLT 501	French					
FLG 501	German					
FLS 501	Spanish					
FLC 501	Chinese					
TOTAL						26

AMITY SCHOOL OF ENGINEERING TECHNOLOGY (ASET)

Program Name: B.Tech. – MECHATRONICS ENGINEERING SIXTH SEMESTER

Code	Title	Category	L	T	P	Credit
	Core Courses					
BMT 601	Design of Mechatronics System	CC	3	0	-	3
BMT 602	Electrical Machines	CC	3	0	-	3
BMT 603	Sensors and Motion Control	CC	2	1	-	3
BMT 604	Automotive Engineering	CC	3	0	-	3
BMT 605	Machine Learning and Computer vision	CC	3	0	-	3
	Practical Courses					
BMT 621	Design of Mechatronics System Lab	PC	-	-	2	1
BMT 622	Electrical Machines Lab	PC	-	-	2	1
BMT 623	Sensors and Motion Control Lab	PC	-	-	2	1
BMT 624	Automotive Engineering Lab	PC	-	-	2	1
						19
	DE Electives 4: Student has to select 1 course from the list of following DE electives					
BMT 607	Aerial Robots	DE	3	-	-	
BMT 608	Industrial Instrumentation	DE	3	-	-	3
BMT 609	Industrial Electronics	DE	3	-	-	
	Open Elective					
	Open Elective-5	OE	3	-	-	3
	Value Added Courses					
BCS 601	Communication Skill – IV	VA	1	-	-	1
BSS 604	Behavioral Science – VI, Stress & Coping Strategies	VA	1	-	-	1
	Foreign Language – VI	VA	2	-	-	2
FLT 601	French					
FLG 601	German					
FLS 601	Spanish					
FLC 601	Chinese					
	TOTAL					**29**

INDUSTRIAL TRAINING – II: 6-8 Weeks

AMITY SCHOOL OF ENGINEERING TECHNOLOGY (ASET)

Program Name: B.Tech. – MECHATRONICS ENGINEERING SEVENTH SEMESTER

Code	Title	Category	L	T	P	Credit
Core Courses						
BMT 701	Hydraulics and Pneumatics	CC	2	-	-	2
BMT 702	Computer Aided Manufacturing	CC	2	-	-	2
Practical Courses						
BMT 721	Hydraulics and Pneumatics Lab	PC	-	-	2	1
BMT 722	Computer Aided Manufacturing Lab	PC	-	-	2	1
BMT 723	Industrial Training (Evaluation)	NTCC	-	-	-	6
BMT 724	Seminar/Minor Project Stage- I	CC	-	-	-	3
						15
DE Electives 5: Student has to select 1 course from the list of following DE electives						
BMT 705	Automation in Industries	DE	3	-	-	
BMT 706	Marketing Management	DE	3	-	-	
BMT 707	Electric and Hybrid Vehicles	DE	3	-	-	
BMT 708	Artificial Intelligence & Robotics	DE	3	-	-	
		DE	3	-	-	3
Value Added Courses						
BCS 701	Communication Skills – V	VA	1	-	-	1
BSS 704	Behavioral Science – VII, Individual Society & Nation	VA	1	-	-	1
	Foreign Language – VII	VA	2	-	-	2
FLT 701	French					
FLG 701	German					
FLS 701	Spanish					
FLC 701	Chinese					
TOTAL						**22**

AMITY SCHOOL OF ENGINEERING TECHNOLOGY (ASET)

Program Name: B.Tech. – MECHATRONICS ENGINEERING EIGHTH SEMESTER

Code	Title	Category	L	T	P	Credit
Core Courses						
BMT 801	Robotic Process Automation	CC	3	-	-	3
Practical Courses						
BMT 811	Project Stage – II	CC	-	-	-	12
DE Electives 6: Student has to select 1 course from the list of following DE electives						
BMT 805	Fuel Cells and Applications	DE	3	-	-	
BMT 806	Entrepreneurship Development	DE	3	-	-	
BMT 807	Flexible Manufacturing Systems	DE	3	-	-	3
BMT 808	Fundamentals of Signal Processing	DE	3	-	-	
BMT 809	Automotive Sensors and Applications	DE	3	-	-	
TOTAL						**18**

28+32+29+28+26+29+22+18=212

APPLIED MATHEMATICS – I

Course Code: **AM 101**   **L:3 T:1 C:4**

Course Objective:
The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Contents:

Module I: Differential Calculus
Successive differentiation, Leibnitz's theorem (without proof), Mean value theorem, Taylor's theorem (proof), Remainder terms, Asymptote & Curvature, Partial derivatives, Chain rule, Differentiation of Implicit functions, Exact differentials, Tangents and Normals, Maxima, Approximations, Differentiation under integral sign, Jacobians and transformations of coordinates.

Module II: Integral Calculus
Fundamental theorems, Reduction formulae, Properties of definite integrals, Applications to length, area, volume, surface of revolution, improper integrals, Multiple Integrals-Double integrals, Applications to areas, volumes.

Module III: Ordinary Differential Equations
Formation of ODEs, Definition of order, degree & solutions, ODE of first order : Method of separation of variables, homogeneous and non homogeneous equations, Exactness & integrating factors, Linear equations & Bernoulli equations, General linear ODE of nth order, Solution of homogeneous equations, Operator method, Method of undetermined coefficients, Solution of simple simultaneous ODE.

Evaluation:

Components	Other Components	Attendance	MTE	ESE
Weightage (%)	10	5	15	70

Text & References:

Text:
- Differential Calculus by Shanti Narain
- Integral Calculus by Shanti Narain

References:
- Differential Equation by A.R. Forsyth
- Higher Engineering Mathematics by H.K. Dass

APPLIED PHYSICS - I - FIELDS AND WAVES

Course Code:　　　　AP 102　　　　　　　　　　　　　　　　　　**L:2 T:1 C:3**

Course Objective:

Aim of this course is to introduce the students to fundamentals of graduate level physics, which form the basis of all applied science and engineering

Course Contents:

Module I: Oscillations & Waves

Oscillations: Introduction to S.H.M. Damped Oscillations: Differential Equation and its solution, logarithmic decrement, Quality Factor, Different conditions of damping of harmonic oscillations. Forced oscillations: Amplitude and Frequency Response, Resonance, Sharpness of Resonance
Plane Progressive Waves: Differential Equation and Solution, Superposition of Progressive Waves stationary waves.
Ultrasonics: Generation and application of ultrasonicwaves.

Module II: Wave Nature of Light

Interference: Coherent Sources, Conditions of interference, Interference due to division of wavefront, Fresnels biprism Interference due to division of amplitude, Newton's rings, Interference due to thin films, .
Diffraction: Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at a single slit, double slit, N Slits, Transmission grating, Rayleigh criterion and Resolving power of grating.
Polarization: Birefringence, Nicol prism, Production and analysis of plane, circularly and elliptically polarized light, Half and quarter wave plates, Optical rotation, Polarimeter.

Module III: Electromagnetics

Scalar and vector fields, gradient of a scalar field, physical significance of gradient, equipotential surface. Line, surface and volume integrals, Divergence and curl of vector field and mathematical analysis physical significance, Electric flux, Gauss' law, Proof and Applications, Gauss divergence and Stokes theorems.
Differential form of Gauss' Law, Amperes' Law, Displacement current, Faradays Law, Maxwell equations in free space & isotropic media (Integral form & differential form), EM wave propagation in free space, Poynting vector.

Evaluation:

Components	Other Components	Attendance	MTE	ESE
Weightage (%)	10	5	15	70

Text & References:

- Waves & oscillation, A. P. French
- Physics of waves, W. C. Elmore & M. A. Heald
- Introduction to Electrodynamics, D. J. Griffith
- Electrodynamics, Gupta, Kumar & Singh
- Optics, A. K. Ghatak
- Engineering Physics, Satya Prakash

APPLIED CHEMISTRY

Course Code: AC 203   **L:02 T:01 C:03**

Course Objective:

Four basic sciences, Physics, Chemistry, Mathematics and Biology are the building blocks in engineering and technology. Chemistry is essential to develop analytical capabilities of students, so that they can characterize, transform and use materials in engineering and apply knowledge in their field. All engineering fields have unique bonds with chemistry whether it is Aerospace, Mechanical, Environmental and other fields the makeup of substances is always a key factor, which must be known. For electronics and computer science engineering, apart from the material, computer modeling and simulation knowledge can be inherited from the molecule designing. The upcoming field of technology like Nanotechnology and Biotechnology depends fully on the knowledge of basic chemistry. With this versatile need in view, course has been designed in such a way so that the student should get an overview of the whole subject.

Course Contents:

Module I: Water Technology
Introduction and specifications of water,
Hardness and its determination (EDTA method only),
Alkalinity,
Boiler feed water, boiler problems – scale, sludge, priming & foaming: causes & prevention, Boiler problems – caustic embrittlement & corrosion : causes & prevention,
Carbonate & phosphate conditioning, colloidal conditioning & calgon treatment
Water softening processes : Lime – soda process, Ion exchange method,
Water for domestic use.

Module II: Fuels
Classification, calorific value of fuel, (gross and net),
Determination of calorific value of fuels, bomb calorimeter,
Solid fuels - Proximate and ultimate analysis,
Octane & Cetane No. and its significance.
Numericals on combustion

Module III: Instrumental Methods of analysis
Introduction; Principles of spectroscopy; Laws of absorbance
IR: Principle, Instrumentation, Application
UV: Principle, Instrumentation, Application
NMR: Principle, Instrumentation, Application

Module IV: Lubricants
Introduction; Mechanism of Lubrication;
Types of Lubricants; Chemical structure related to Lubrication;
Properties of lubricants; Viscosity and Viscosity Index; Iodine Value; Aniline Point; Emulsion number; Flash Point; Fire Point; Drop Point; Cloud Point; Pour Point.
Selection of Lubricants.

Module V: Corrosion
Introduction, Mechanism of dry and wet corrosion,
Types of corrosion-Galvanic, Concentration cell, soil, pitting, intergranular, waterline. Passivity.
Factors influencing corrosion.
Corrosion control.

Evaluation:

Components	Other Components	Attendance	MTE	ESE
Weightage (%)	10	5	15	70

Text & References:

Text:
- Engineering Chemistry- Jain and Jain

- Engineering Chemistry- Sunita Rattan
- Engineering Chemistry - Shashi Chawla

References:
- Engineering Chemistry – Dara and Dara
- Spectroscopy- Y.R Sharma
- Corrosion Engineering – Fontenna and Greene

ELEMENTS OF MECHANICAL ENGINEERING

Course Code: BME 205   L:02,T:01,C:03

Course Objective:

The objective of this course is to impart the basic knowledge of thermodynamics, stress- strain, materials & their properties and various manufacturing processes to the students of all engineering discipline.

Course Contents:

Module I: Materials: Classification of engineering material, composition of cast iron and carbon steels on iron-carbon diagram and their mechanical properties; Alloy steel and their applications; stress-strain diagram, Hooks law and modulus of elasticity. Tensile, shear, hardness and fatigue testing of materials.

Module II: Measurement:
Temperature, pressure, velocity, flow, strain, force and torque measurement, measurement by Vernier caliper, micrometer, dial gauges, slip gauges, sine-bar and combination set;

Module III: Mechanical Machines:
Introduction to Lathe, Drilling, Milling and Shaping machines, NC machine, CNC machine and DNC machine..

Module IV: Fluids: Fluid properties, pressure, density and viscosity; pressure variation with depth, static and kinetic energy; Euler and Bernouli's equation for incompressible fluids, viscous and turbulent flow, working principle of pumps, compressors and turbines,

Module V: Thermodynamics:
First and second law of thermodynamics; Formation of steam, steam properties, classification and working of boilers, efficiency & performance analysis, natural and induced draught, Refrigeration, vapor absorption & compression cycles, coefficient of perform (COP), Refrigerants

Module VI: I. C. Engines:
Construction, Nomenclature; working of two stroke & four stroke petrol & diesel IC engines, Carnot cycle and ideal efficiency; Otto and diesel cycles;

Module VII: Introduction to Fabrication Processes
Casting Process, Welding & allied process, Forging process.

Evaluation:

Components	Other Components	Attendance	MTE	ESE
Weightage (%)	10	5	15	70

Text & References:

- S Trymbaka Murthy (2011) Elements of Mechanical Engineering- I K International Publishing House Pvt. Ltd;
- R.K. Rajput (, 2005) Elements of Mechanical Engineering- Firewall Media
- P.K. Nag,(2005) Engineering thermodynamics- Tata McGraw-Hill Education,
- Automation, Productions systems, and computer Integrated manufacturing by Mikell P. Groover

INTRODUCTION TO COMPUTERS AND PROGRAMMING IN C

Course Code: BCS 104   **L:02 T:01 C:03**

Course Objective:
The objective of this course module is to acquaint the students with the basics of computers system, its components, data representation inside computer and to get them familiar with various important features of procedure oriented programming language i.e. C.

Course Contents:

Module I: Introduction
Introduction to computer, history, von-Neumann architecture, memory system (hierarchy, characteristics and types), H/W concepts (I/O Devices), S/W concepts (System S/W & Application S/W, utilities). Data Representation: Number systems, character representation codes, Binary ,octal, hexadecimal and their interconversions. Binary arithmetic, floating point arithmetic, signed and unsigned numbers, Memory storage unit.

Module II: Programming in C
History of C, Introduction of C, Basic structure of C program, Concept of variables, constants and data types in C, Operators and expressions: Introduction, arithmetic, relational, Logical, Assignment, Increment and decrement operator, Conditional, bitwise operators, Expressions, Operator precedence and associativity. Managing Input and output Operation, formatting I/O.

Module III: Fundamental Features in C
C Statements, conditional executing using if, else, nesting of if, switch and break Concepts of loops, example of loops in C using for, while and do-while, continue and break. Storage types (automatic, register etc.), predefined processor, Command Line Argument.

Module IV: Arrays and Functions
One dimensional arrays and example of iterative programs using arrays, 2-D arrays Use in matrix computations. Concept of Sub-programming, functions Example of user defined functions. Function prototype, Return values and their types, calling function, function argument, function with variable number of argument, recursion.

Module V: Advanced features in C
Pointers, relationship between arrays and pointers Argument passing using pointers, Array of pointers. Passing arrays as arguments.
Strings and C string library.
Structure and Union. Defining C structures, Giving values to members, Array of structure, Nested structure, passing strings as arguments.
File Handling.

Evaluation:

Components	Other Components	Attendance	MTE	ESE
Weightage (%)	10	5	15	70

Text & References:

Text:

- "ANSI C" by E Balagurusamy
- Yashwant Kanetkar, "Let us C", BPB Publications, 2nd Edition, 2001.
- Herbert Schildt, "C: The complete reference", Osbourne McGraw Hill, 4th Edition, 2002.
- V. Raja Raman, "Computer Programming in C", Prentice Hall of India, 1995.

References:

- Kernighan & Ritchie, "C Programming Language", The (Ansi C Version), PHI, 2nd Edition.
- J. B Dixit, "Fundamentals of Computers and Programming in 'C'.
- P.K. Sinha and Priti Sinha, "Computer Fundamentals", BPB publication.

BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course Code: **BEE 105**   **L:02,T:01,C:03**

Course Objective:

The objective of the course is to provide a brief knowledge of Electrical Engineering to students of all disciplines. This Course includes some theorems related to electrical, some law's related to flow of current, voltages, basic knowledge of Transformer, basic knowledge of electromagnetism, basic knowledge of electrical network.

Course Contents:

Module I: Basic Electrical Quantities

Basic Electrical definitions-Energy, Power, Charge, Current, Voltage, Electric Field Strength, Magnetic Flux Density, etc., Resistance, Inductance and Capacitance. Ideal Source, Independent Source and Controlled Source

Module II: Network Analysis Techniques & Theorems

Circuit Principles: Ohm's Law, Kirchoff's Current Law, Kirchoff's Voltage Law Network Reduction: Star– Delta Transformation, Source Transformation, Nodal Analysis, Loop analysis. Superposition theorem, Thevenin's Theorem, Norton's theorem and Reciprocity theorem.

Module III: Alternating Current Circuits

Peak, Average and RMS values for alternating currents, Power calculation:
reactive power, active power, Complex power, power factor, impedance, reactance, conductance, susceptance
Resonance: series Resonance, parallel resonance, basic definition of Q factor & Band-width.

Module IV: Transformers

Basic Transformer Operation principle, Construction, Voltage relations, current relations, Linear circuit models, open circuit test, short circuit test, Transformer Efficiency.

Evaluation:

Components	Other Components	Attendance	MTE	ESE
Weightage (%)	10	5	15	70

Text & References:

- R.J. Smith, R.C. Dorf: Circuits, devices and Systems
- B.L. Thareja: Electrical Technology : Part -1 & 2
- V. Deltoro: Electrical Engineering fundamentals
- Schaum's Series: Electrical Circuits

APPLIED PHYSICS LAB - I

Course Code: **AP 122**   **P:02,C:01**

List of Experiments:

1. To determine the wavelength of sodium light by Newton's rings method.

2. To determine the dispersive power of the material of prism with the help of a spectrometer.

3. To determine the specific rotation of sugar by Bi-quartz or Laurent half shade polarimeter.

4. To determine the speed of ultrasonic waves in liquid by diffraction method.

5. To determine the width of a narrow slit using diffraction phenomena.

6. To determine the temperature coefficient of platinum wire, using a platinum resistance thermometer and a Callender & Griffth's bridge.

7. To determine the value of specific charge (ratio of e/m) of an electron by Thomson method.

8. To determine the internal resistance of Leclanche cell with the help of Potentiometer.

9. To determine the resistance per unit length of a Carey Foster's bridge wire and also to find out the specific resistance of a given wire.

10. To plot graph showing the variation of magnetic field with distance along the aixs of a circular coil carrying current, and hence estimate the radius of the coil.

11. To determine the value of acceleration due to gravity ('g') in the laboratory using bar pendulum.

12. To determine the moment of inertia of a flywheel about its own axis of rotation.

13. To determine the density of material of the given wire with the help of sonometer.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

APPLIED CHEMISTRY LAB

Course Code: AC 223   **P:02,C:01**

Course Contents:

List of Experiments:

(Any 10 Experiments)

1. To determine the ion exchange capacity of a given cation exchanger.

2. To determine the temporary, permanent and total hardness of a sample of water by complexometric titration method.

3. To determine the type and extent of alkalinity of given water sample.

4. To determine the number of water molecules of crystallization in Mohr's salt (ferrous ammonium sulphate) provided standard potassium dichromate solution (0.1N) using diphenylamine as internal indicator.

5. To determine the ferrous content in the supplied sample of iron ore by titrimetric analysis against standard $K_2Cr_2O_7$ solution using potassium ferricyanide $[K_3Fe(CN)_6]$ as external indicator.

6. To determine the surface tension of a given liquid by drop number method.

7. To determine the composition of a liquid mixture A and B (acetic acid and water) by surface tension method.

8. To prepare and describe a titration curve for phosphoric acid – sodium hydroxide titration using pH-meter.

9. To find the cell constant of conductivity cell.

10. Determine the strength of hydrochloric acid solution by titrating it against standard sodium hydroxide solution conduct metrically

11. Determination of Dissolved oxygen in the given water sample.

12. To determine the total residual chlorine in water.

13. Determination of amount of oxalic acid and H_2SO_4 in 1 L of solution using N/10 NaOH and N/10 $KMnO_4$ solution.

14. Determination of viscosity of given oil by means of Redwood viscometer I.

15. To determine flash point and fire point of an oil by Pensky Martin's Apparatus

16. To determine the Iodine value of the oil.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

ELEMENTS OF MECHANICAL ENGINEERING LAB

Course Code: BME 225   **P:02,C:01**

Course Contents:

- Tensile testing of standard mild steel specimen.

- To verify Bernoulli's theorem.

- Flow measurements by venturi and orifice meters.

- Linear and angular measurement using, Vernier; Micrometer, slip gauge, dial gauge and sine-bar.

- Study of different types of boilers and mountings.

- Study of 4 – Stroke Petrol and Diesel Engines

- Study of 2 – Stroke Petrol and Diesel Engines

- To find COP of a Vapour Compression Refrigeration system

- To perform various operations on Lathe and Study of Lathe.

- *Welding:*
  Introduction of welding processes, classification, gas welding, arc welding, resistance welding.

- *Sheet metal working:*
  Introduction to sheet metal shop, Shearing, trimming, blanking, piercing, shaving, notching, stretch forming, nibbling coining, embossing and drawing.

- *Casting*:
  Introduction of casting, pattern, mould making procedures, sand mould casting, casting defects, allowances of pattern.

- *Forging:*
  Forging-introduction, upsetting & drawing out, drop forging, press forging & m/c forging

- Carpentry shop

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

PROGRAMMING IN C LAB

Course Code: **BCS 124**   **P:02,C:01**

Software Required: Turbo C

Course Contents:

- C program involving problems like finding the nth value of cosine series, Fibonacci series. Etc.

- C programs including user defined function calls

- C programs involving pointers, and solving various problems with the help of those.

- File handling

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

ELECTRICAL SCIENCE LAB

Course Code: **BEE 125**   **P:02, C:01**

List of Experiments:

1. To verify KVL & KCL in the given network.

2. To verify Superposition Theorem.

3. To verify Maximum Power Transfer Theorem.

4. To verify Reciprocity Theorem.

5. To determine and verify RTh, VTh, RN, IN in a given network.

6. To perform open circuit & short circuit test on a single-phase transformer.

7. To study transient response of a given RLC Circuit.

8. To perform regulation, ratio & polarity test on a single-phase transformer.

9. To measure power & power factor in a three phase circuit by two wattmeter method.

10. To measure power & power factor in a three phase load using three ammeter & three voltmeter method.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

ENGLISH

Course Code: BCS 101   **C:01**

Course Objective:

The course is intended to give a foundation of English Language. The literary texts are indented to help students to inculcate creative & aesthetic sensitivity and critical faculty through comprehension, appreciation and analysis of the prescribed literary texts. It will also help them to respond form different perspectives.

Course Contents:

Module I: Vocabulary
Use of Dictionary
Use of Words: Diminutives, Homonyms & Homophones

Module II: Essentials of Grammar - I
Articles
Parts of Speech
Tenses

Module III: Essentials of Grammar - II
Sentence Structure
Subject -Verb agreement
Punctuation

Module IV: Communication
The process and importance
Principles & benefits of Effective Communication

Module V: Spoken English Communication
Speech Drills
Pronunciation and accent
Stress and Intonation

Module VI: Communication Skills-I
Developing listening skills
Developing speaking skills

Module VII: Communication Skills-II
Developing Reading Skills
Developing writing Skills

Module VIII: Written English communication
Progression of Thought/ideas
Structure of Paragraph
Structure of Essays

Module IX: Short Stories
Of Studies, by Francis Bacon
Dream Children, by Charles Lamb
The Necklace, by Guy de Maupassant
A Shadow, by R.K. Narayan
Glory at Twilight, Bhabani Bhattacharya

Module X: Poems

All the Worlds a Stage	Shakespeare
To Autumn	Keats
O! Captain, My Captain.	Walt Whitman
Where the Mind is Without Fear	Rabindranath Tagore
Psalm of Life	H.W. Longfellow

Examination Scheme:

Components	A	CT	HA	EE
Weightage (%)	05	15	10	70

Text & References:

- Madhulika Jha, Echoes, Orient Long Man
- Ramon & Prakash, Business Communication, Oxford.
- Sydney Greenbaum Oxford English Grammar, Oxford.
- Successful Communications, Malra Treece (Allyn and Bacon)
- Effective Technical Communication, M. Ashraf Rizvi.

* 30 hrs Programme to be continued for Full year

BEHAVIOURAL SCIENCE - I
(UNDERSTANDING SELF FOR EFFECTIVENESS)

Course Code: BSS 104   **C: 01**

Course Objective:
 This course aims at imparting:
- Understanding self & process of self exploration
- Learning strategies for development of a healthy self esteem
- Importance of attitudes and its effective on personality
- Building Emotional Competence

Course Contents:

Module I: Self: Core Competency
Understanding of Self
Components of Self – Self identity
Self concept
Self confidence
Self image

Module II: Techniques of Self Awareness
Exploration through Johari Window
Mapping the key characteristics of self
Framing a charter for self
Stages – self awareness, self acceptance and self realization

Module III: Self Esteem & Effectiveness
Meaning and Importance
Components of self esteem
High and low self esteem
Measuring your self esteem

Module IV: Building Positive Attitude
Meaning and nature of attitude
Components and Types of attitude
Importance and relevance of attitude

Module V: Building Emotional Competence
Emotional Intelligence – Meaning, components, Importance and Relevance
Positive and Negative emotions
Healthy and Unhealthy expression of emotions

Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Examination Scheme:

Components	SAP	A	Mid Term Test (CT)	VIVA	Journal for Success (JOS)
Weightage (%)	20	05	20	30	25

Text & References:

- Organizational Behaviour, Davis, K.
- Hoover, Judhith D. Effective Small Group and Team Communication, 2002,Harcourt College Publishers
- Dick, Mc Cann & Margerison, Charles: Team Management, 1992 Edition, viva books
- Bates, A. P. and Julian, J.: Sociology - Understanding Social Behaviour
- Dressler, David and Cans, Donald: The Study of Human Interaction
- Lapiere, Richard. T – Social Change
- Lindzey, G. and Borgatta, E: Sociometric Measurement in the Handbook of Social Psychology, Addison – Welsley, US.
- Rose, G.: Oxford Textbook of Public Health, Vol.4, 1985.

- LaFasto and Larson: When Teams Work Best, 2001, Response Books (Sage), New Delhi
- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 2, Group (1996); Pfeiffer & Company
- Smither Robert D.; The Psychology of Work and Human Performance, 1994, Harper Collins College Publishers

FRENCH - I

Course Code: **FLF 101**   **C: 02**

Course Objective:
To familiarize the students with the French language
- with the phonetic system
- with the syntax
- with the manners
- with the cultural aspects

Course Contents:

Module A: pp. 01 to 37: Unités 1, 2, Unité 3 Object if 1, 2
Only grammar of Unité 3: objectif 3, 4 and 5

Contenu lexical: Unité 1: Découvrir la langue française : (oral et écrit)
1. se présenter, présenter quelqu'un, faire la connaissance des autres, formules de politesse, rencontres
2. dire/interroger si on comprend
3. Nommer les choses

Unité 2: Faire connaissance
1. donner/demander des informations sur une personne, premiers contacts, exprimer ses goûts et ses préférences
2. Parler de soi: parler du travail, de ses activités, de son pays, de sa ville.

Unité 3: Organiser son temps
1. dire la date et l'heure

Contenu grammatical:
1. organisation générale de la grammaire
2. article indéfini, défini, contracté
3. nom, adjectif, masculin, féminin, singulier et pluriel
4. négation avec « de », "moi aussi", "moi non plus"
5. interrogation : Inversion, est-ce que, qui, que, quoi, qu'est-ce que, où, quand, comment, quel(s), quelle(s)
   Interro-négatif : réponses : oui, si, non
6. pronom tonique/disjoint- pour insister après une préposition
7. futur proche

Examination Scheme:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- le livre à suivre : Campus: Tome 1

GERMAN - I

Course Code: **FLG 101**   **C: 02**

Course Objective:
To enable the students to converse, read and write in the language with the help of the basic rules of grammar, which will later help them to strengthen their language.
To give the students an insight into the culture, geography, political situation and economic opportunities available in Germany

Course Contents:

Module I: Introduction
Self introduction: heissen, kommen, wohnwn, lernen, arbeiten, trinken, etc.
All personal pronouns in relation to the verbs taught so far.
Greetings: Guten Morgen!, Guten Tag!, Guten Abend!, Gute Nacht!, Danke sehr!, Danke!, Vielen Dank!, (es tut mir Leid!),
Hallo, wie geht's?:   Danke gut!, sehr gut!, prima!, ausgezeichnet!,
                                        Es geht!, nicht so gut!, so la la!, miserabel!

Module II: Interviewspiel
To assimilate the vocabulary learnt so far and to apply the words and phrases in short dialogues in an interview – game for self introduction.

Module III: Phonetics
Sound system of the language with special stress on Dipthongs

Module IV: Countries, nationalities and their languages
To make the students acquainted with the most widely used country names, their nationalitie and the language spoken in that country.

Module V: Articles
The definite and indefinite articles in masculine, feminine and neuter gender. All Vegetables, Fruits, Animals, Furniture, Eatables, modes of Transport

Module VI: Professions
To acquaint the students with professions in both the genders with the help of the verb "sein".

Module VII: Pronouns
Simple possessive pronouns, the use of my, your, etc.
The family members, family Tree with the help of the verb "to have"

Module VIII: Colours
All the color and color related vocabulary – colored, colorful, colorless, pale, light, dark, etc.

Module IX: Numbers and calculations – verb "kosten"
The counting, plural structures and simple calculation like addition, subtraction, multiplication and division to test the knowledge of numbers.
"Wie viel kostet das?"

Module X: Revision list of Question pronouns
W – Questions like who, what, where, when, which, how, how many, how much, etc.

Examination Scheme:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- Wolfgang Hieber, Lernziel Deutsch
- Hans-Heinrich Wangler, Sprachkurs Deutsch

- Schulz Griesbach, Deutsche Sprachlehre für Ausländer
- P.L Aneja, Deutsch Interessant- 1, 2 & 3
- Rosa-Maria Dallapiazza et al, Tangram Aktuell A1/1,2
- Braun, Nieder, Schmöe, Deutsch als Fremdsprache 1A, Grundkurs

SPANISH – I

Course Code: **FLS 101**   **C: 02**

Course Objective:
To enable students acquire the relevance of the Spanish language in today's global context, how to greet each other. How to present / introduce each other using basic verbs and vocabulary

Course Contents:

Module I
A brief history of Spain, Latin America, the language, the culture…and the relevance of Spanish language in today's global context.
Introduction to alphabets

Module II
Introduction to '*Saludos*' (How to greet each other. How to present / introduce each other).
Goodbyes (despedidas)
The verb *llamarse* and practice of it.

Module III
Concept of Gender and Number
Months of the years, days of the week, seasons. Introduction to numbers 1-100, Colors, Revision of numbers and introduction to ordinal numbers.

Module IV
Introduction to *SER* and *ESTAR* (both of which mean To Be).Revision of '*Saludos*' and '*Llamarse*'. Some adjectives, nationalities, professions, physical/geographical location, the fact that spanish adjectives have to agree with gender and number of their nouns. Exercises highlighting usage of *Ser* and *Estar*.

Module V
Time, demonstrative pronoun (Este/esta, Aquel/aquella etc)

Module VI
Introduction to some key AR /ER/IR ending regular verbs.

Examination Scheme:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- Español, En Directo I A
- Español Sin Fronteras

JAPANESE - I

Course Code: FLJ 101   **C: 02**

Course Objective:
To enable the students to learn the basic rules of grammar and Japanese language to be used in daily life that will later help them to strengthen their language.

Course Contents:

Module I: Salutations
Self introduction, Asking and answering to small general questions

Module II: Cardinal Numbers
Numerals, Expression of time and period, Days, months

Module III: Tenses
Present Tense, Future tense

Module IV: Prepositions
Particles, possession, Forming questions

Module V: Demonstratives
Interrogatives, pronoun and adjectives

Module VI: Description
Common phrases, Adjectives to describe a person

Module VII: Schedule
Time Table, everyday routine etc.

Module VIII: Outings
Going to see a movie, party, friend's house et*c*.

Learning Outcome
➢ Students can speak the basic language describing above mentioned topics

Methods of Private study /Self help
➢ Handouts, audio-aids, and self-do assignments and role-plays will support classroom teaching

Examination Scheme:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

Text:
- Teach yourself Japanese

References:
- Shin Nihongo no kiso 1

CHINESE – I

Course Code: **FLC 101**   **C: 02**

Course Objective:

There are many dialects spoken in China, but the language which will help you through wherever you go is Mandarin, or Putonghua, as it is called in Chinese. The most widely spoken forms of Chinese are Mandarin, Cantonese, Gan, Hakka, Min, Wu and Xiang. The course aims at familiarizing the student with the basic aspects of speaking ability of Mandarin, the language of Mainland China. The course aims at training students in practical skills and nurturing them to interact with a Chinese person.

Course Contents:

Module I
Show pictures, dialogue and retell.
Getting to know each other.
Practicing chart with Initials and Finals. (CHART – The Chinese Phonetic Alphabet Called "Hanyu Pinyin" in Mandarin Chinese.)
Practicing of Tones as it is a tonal language.
Changes in 3rd tone and Neutral Tone.

Module II
Greetings
Let me Introduce
The modal particle "ne".
Use of Please 'qing" – sit, have tea................... etc.
A brief self introduction – Ni hao ma? Zaijian!
Use of "bu" negative.

Module III
Attributives showing possession
How is your Health? Thank you
Where are you from?
A few Professions like – Engineer, Businessman, Doctor, Teacher, Worker.
Are you busy with your work?
May I know your name?

Module IV
Use of "How many" – People in your family?
Use of "zhe" and "na".
Use of interrogative particle "shenme", "shui", "ma" and "nar".
How to make interrogative sentences ending with "ma".
Structural particle "de".
Use of "Nin" when and where to use and with whom. Use of guixing.
Use of verb "zuo" and how to make sentences with it.

Module V
Family structure and Relations.
Use of "you" – "mei you".
Measure words
Days and Weekdays.
Numbers.
Maps, different languages and Countries.

Examination Scheme:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- "Elementary Chinese Reader Part I" Lesson 1-10

APPLIED MATHEMATICS – II

Course Code: AM 201   **L:03 T:01 C: 04**

Course Objective:

The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Contents:

Module I: Linear Algebra

Hermitian and Skew Hermitian Matrix, Unitary Matrix, Orthogonal Matrix, Elementary Row Transformation, Reduction of a Matrix to Row Echelon Form, Rank of a Matrix, Consistency of Linear Simultaneous Equations, Gauss Elimination Method, Gauss-Jordan Method, Eigen Values and Eigen Vectors of a Matrix, Caley- Hamilton Theorem, Diagonalization of a Matrix, Vector Space, Linear Independence and Dependence of Vectors, Linear Transformations.

Module II: Infinite Series

Definition of Sequence, Bounded Sequence, Limit of a Sequence, Series, Finite and Infinite Series, Convergence and Divergence of Infinite series, Cauchy's Principle of Convergence, Positive Term Infinite Series, Comparison test, D'Alembert's Ratio test. Raabe's Test, Cauchy's nth root Test. Logarithmic Test, Alternating Series, Leibnitz's Test, Absolute and conditioinal convergence, Uniform Convergence, Power Series and its Interval of Convergence.

Module III: Complex Analysis

De Moivre's Theorem and Roots of Complex Numbers, Logarithmic Functions, Circular, Hyperbolic Functions and their Inverses.
Functions of a Complex Variables, Limits, Continuity and Derivatives, Analytic Function, Cauchy-Riemann Equations (without proof), Harmonic Function, Harmonic Conjugates, Conformal Mapping, Bilinear Transformations, Complex Line Integral, Cauchy Integral Theorem, Cauchy Integral Formula, Derivative of Analytic Function, Power Series, Taylor Series, Laurent Series, Zeroes and Singularities, Residues, Residue Theorem, Evaluation of Real Integrals of the Form $\int_0^{2\pi} F(\cos\theta, \sin\theta)\, d\theta$ and $\int_{-\infty}^{\infty} \frac{f(x)}{\overline{F(x)}}\, dx$.

Module IV: Statistics and Probability

Moments, Skewness, Kurtosis, Random Variables and Probability Distribution, Mean and Variance of a Probability Distribution, Binomial Distribution, Poisson Distribution and Normal Distribution.

Evaluation:

Components	Other Components	Attendance	MTE	ESE
Weightage (%)	10	5	15	70

Text & References:

- Engineering Mathematics by Erwin Kreyszig.
- Engineering Mathematics by R.K. Jain and S.R.K. Iyengar.
- Higher Engineering Mathematics by H.K. Dass.
- Engineering Mathematics by B.S. Grewal.
- Differential Calculus by Shanti Narain.
- Integral Calculus by Shanti Narain.
- Linear Algebra- Schaum Outline Series.

APPLIED PHYSICS - II - MODERN PHYSICS

Course Code: AP 202   **L:02 T:01 C: 03**

Course Objective:
Aim of this course is to introduce the students to fundamentals of graduate level physics which form the basis of all applied science and engineering

Course Contents:

Module I: Special Theory of Relativity
Michelson-Morley experiment, Importance of negative result, Inertial & non-inertial frames of reference, Einstein's postulates of Special theory of Relativity, Space-time coordinate system, Relativistic Space Time transformation (Lorentz transformation equation), Transformation of velocity, Addition of velocities, Length contraction and Time dilation, Mass-energy equivalence (Einstein's energy mass relation) & Derivation of Variation of mass with velocity,

Module II: Wave Mechanics
Wave particle duality, De-Broglie matter waves, phase and group velocity, Heisenberg uncertainty principle, wave function and its physical interpretation, Operators, expectation values. Time dependent & time independent Schrödinger wave equation for free & bound states, square well potential (rigid wall), Step potential.

Module III: Atomic Physics
Vector atom model, LS and j-j coupling, Zeceman effect (normal & anomalous), Paschen-Bach effect, X-ray spectra and energy level diagram, Moseleys Law, Lasers – Einstein coefficients, conditions for light amplification, population inversion, optical pumping, three level and four level lasers, He-Ne and Ruby laser, Properties and applications of lasers.

Module IV: Solid State Physics
Sommerfield's free electron theory of metals, Fermi energy, Introduction to periodic potential & Kronig-Penny model (Qualitative) Band Theory of Solids, Semi-conductors: Intrinsics and Extrinsic Semiconductors, photoconductivity and photovotaics, Basic aspects of Superconductivity, Meissner effect.

Evaluation:

Components	Other Components	Attendance	MTE	ESE
Weightage (%)	10	5	15	70

Text & References:

- Concept of Modern Physics, A. Beiser
- Applied Physics II, Agarawal & Goel
- Solid State Physics, S. O. Pallai
- Physics of Atom, Wehr & Richards

OBJECT ORIENTED PROGRAMMING USING C++

Course Code: **BCS 203**   **L:02 T:01 C: 03**

Course Objective:
The objective of this module is to introduce object oriented programming. To explore and implement the various features of OOP such as inheritance, polymorphism, Exceptional handling using programming language C++. After completing this course student can easily identify the basic difference between the programming approaches like procedural and object oriented.

Course Contents:

Module I: Introduction
Review of C, Difference between C and C++, Procedure Oriented and Object Oriented Approach. Basic Concepts: Objects, classes, Principals like Abstraction, Encapsulation, Inheritance and Polymorphism. Dynamic Binding, Message Passing. Characteristics of Object-Oriented Languages. Introduction to Object-Oriented Modeling techniques (Object, Functional and Dynamic Modeling).

Module II: Classes and Objects
Abstract data types, Object & classes, attributes, methods, C++ class declaration, Local Class and Global Class, State identity and behaviour of an object, Local Object and Global Object, Scope resolution operator, Friend Functions, Inline functions, Constructors and destructors, instantiation of objects, Types of Constructors, Static Class Data, Array of Objects, Constant member functions and Objects, Memory management Operators.

Module III: Inheritance
Inheritance, Types of Inheritance, access modes – public, private & protected, Abstract Classes, Ambiguity resolution using scope resolution operator and Virtual base class, Aggregation, composition vs classification hiérarchies, Overriding inheritance methods, Constructors in derived classes, Nesting of Classes.

Module IV: Polymorphism
Polymorphism, Type of Polymorphism – Compile time and runtime, Function Overloading, Operator Overloading (Unary and Binary) Polymorphism by parameter, Pointer to objects, this pointer, Virtual Functions, pure virtual functions.

Module V: Strings, Files and Exception Handling
Manipulating strings, Streams and files handling, formatted and Unformatted Input output. Exception handling, Generic Programming – function template, class Template Standard Template Library: Standard Template Library, Overview of Standard Template Library, Containers, Algorithms, Iterators, Other STL Elements, The Container Classes, General Theory of Operation, Vectors.

Evaluation:

Components	Other Components	Attendance	MTE	ESE
Weightage (%)	10	5	15	70

Text & References:

Text:

- A.R. Venugopal, Rajkumar, T. Ravishanker "Mastering C++", TMH, 1997
- R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004.
- "Object Oriented Programming with C++" By E. Balagurusamy.
- Schildt Herbert, "C++: The Complete Reference", Wiley DreamTech, 2005.

References:

- Parasons, "Object Oriented Programming with C++", BPB Publication, 1999.
- Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication, 2002.
- Yashwant Kanethkar, "Object Oriented Programming using C++", BPB, 2004

ENGINEERING MECHANICS

Course Code: BME 204   **L:02 T:01 C: 03**

Course Objective:
Objective of this course is to provide fundamental knowledge of force system and its effect on the behaviour of the bodies that may be in dynamic or in static state. It includes the equilibrium of different structures like beams, frames, truss etc and the force transfer mechanism in the different components of a body under given loading condition.

Course Contents:

Module I: Force system & Structure
Free body diagram, Equilibrium equations and applications. Plane truss, perfect and imperfect truss, assumption in the truss analysis, analysis of perfect plane trusses by the method of joints, method of section.

Module II: Friction
Static and Kinetic friction, laws of dry friction, co-efficient of friction, angle of friction, angle of repose, cone of friction, friction lock, efficiency of screw jack, transmission of power through belt, Ratio of tension, centrifugal tension, condition of maximum power transmission., Initial tension

Module III: Distributed Force
Determination of center of gravity, center of mass and centroid by direct integration and by the method of composite bodies, area moment of inertia by direct integration and composite bodies method, radius of gyration, parallel axis theorem, perpendicular axis theorem, polar moment of inertia**.**

Module IV: Stress Strain Analysis
Simple stress and strain: introduction, normal shear, and stresses-strain diagrams for ductile and brittle materials. Elastic constants, Strain Energy, Properties of material-strength, elasticity, stiffness, malleability, ductility, brittleness, hardness and plasticity etc; Concept of stress and strain.

Examination Scheme:

Components	Other Components	Attendance	MTE	ESE
Weightage (%)	10	5	15	70

MTE- Mid-term Examination

Text & References:
- D.S. Kumar (2009) Engineering Mechanics – S. K. Kataria & Sons
- Dr. R.K. Bansal (2008) Engineering Mechanics – Laxmi Publication
- J. L. Meriam, L. G. Kraige (2012) Engineering Mechanic-Don Fowley
- Timoshenko, Engineering Mechanics, McGraw Hill
- R. S. Khurmi, Engineering Mechanics, S. Chand Publication
- H. Shames & G. K. M. Rao, Engineering Mechanics, Pearson Education, 2006

ENGINEERING GRAPHICS

Course Code: **BME 205**   **L:01 C: 01**

Course Contents:

Module 1: Scales & Curves
Representative factor, Plain Scales, Diagonal Scales, Comperative Scales and Scale of chords. Construction of ellipse, Parabola, Hyperbola, Cycloid, Epicycloid, Hypocycloid, Involutes and Spirals by various methods.

Module 2: Projection of Points & Straight lines
Projection of points, Projection of straight lines. True inclinations and true length of straight lines.

Module 3: Projection of planes and solids
Projection of circle, triangle, polygons, polyhedrons, pyramids, cylinders and cones in different positions.

Module 1: Section of solids and Isometric projections
Section of right solids by normal and inclined planes, Orthographic projection, first angle & third angle projection. Isometric scale, Isometric axes, Isometric projection from orthographic drawing.

Examination Scheme:

Components	Other Components	Attendance	MTE	ESE
Weightage (%)	10	5	15	70

MTE- Mid-term Examination

Text & References:
- Engineering Graphics – Basant Agrawal and Dr. C. M. Agrawal, Tata McGraw-Hill Publishing Company Ltd.
- Engineering Drawing – by N. D. Bhatt
- Engineering Drawing and Graphics – by Veenugopal
- Engineering Drawing – by T. Jeyopoovan

INTRODUCTION TO ENGINEERING AND DESIGN

Course Code: BMT 205   L:2 T:0 C:2

Course Objective:

Aim of this course is to provide a broader perspective of design covering function, cost, environmental sensitivity, safety and other factors other than engineering analysis and make aware of the product oriented and user oriented aspects that make the design a success.

Course Contents:

Module I: -Introduction to Mechatronics System Design

Design and its objectives; Design constraints, Design functions, Design means and Design from; Role of Science, Engineering and Technology in design; Engineering as a business proposition; Functional and Strength Designs. Design form, function and strength;

Module II: Processes in Design for Mechatronics Systems

Design process- Different stages in design and their significance; Defining the design space; Analbgies and "thinking outside of the box"; Quality function deployment-meeting what the customer wants; Evaluation and choosing of a design. Design Communication; Detailed 2D drawings; Tolerance; Use of standard items in design; Research needs in design; Energy needs of the design, both in its realization and in the applications

Module III: Prototype for Mechatronics Systems

Prototyping- rapid prototyping; testing and evaluation of design; Design modifications; Freezing the design; Cost analysis. Engineering the design - From prototype to product. Planning; Scheduling; Supply chains; inventory; handling; manufacturing/construction operations; storage; packaging; shipping; marketing; feed-back on design

Module III: Quality Aspects in Mechatronic Systems

Design for "X"; covering quality, reliability, safety, manufacturing/construction, assembly, maintenance, logistics, handling; disassembly; recycling; re-engineering etc.

Evaluation:

Components	Other Components	Attendance	MTE	ESE
Weightage (%)	10	5	15	70

Text & References:

Text:
- Balmer, R. T., Keat, W. D., Wise, G., and Kosky, P., Exploring Engineering, Third Edition: An Introduction to Engineering and Design - [Part 3 - Chapters 17 to 27], ISBN13: 978-0124158917 ISBN-10: 0124158919

- Haik, Y. And Shahin, M. T., Engineering Design Process, Cengage Learning, ISBN-13: 978-0-495- 66816-9.
- Dym, C. L., Little, P. and Orwin, E. J., Engineering Design - A Project based introduction - Wiley, ISBN-978-1-118-32458-5
- Eastman, C. M. (Ed.), Design for X Concurrent engineering imperatives, 1996, XI, 489 p. ISBN 97894-011-3985-4 Springer

References:
- Pahl, G., Beitz, W., Feldhusen, J. and Grote, K. H., Engineering Design: A Systematic Approach, 3rd ed. 2007, XXI, 617p., ISBN 978-1-84628-319-2
- Voland, G., Engineering by Design, ISBN 978-93-325-3505-3, Pearson India

APPLIED PHYSICS LAB - II

Course Code: **AP 222**   **P:02 C: 01**

List of Experiments:

1. To determine the wavelength of prominent lines of mercury spectrum using plane transmission grating.

2. To determine the thickness of a given wire by Wedge method.

3. To determine the wavelength of He-Ne laser light using single slit.

4. To determine the frequency of an electrically maintained tunning fork by Melde's method.

5. To study the variation of magnetic field along the axis of Helmholtz coil and to find out reduction factor.

6. To draw the V – I characteristics of a forward and reverse bias PN junction diode.

7. To determine the frequency of AC mains using sonometer.

8. To determine the energy band-gap of Germanium crystal using four probes method.

9. To draw V – I characteristics of a photocell and to verify the inverse square law of radiation.

10. To determine the acceleration due to gravity ('g') using Keter's reversible pendulum.

11. To study the characteristics of photo voltaic cell (solar cell).

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

OBJECT ORIENTED PROGRAMMING USING C++ LAB

Course Code: **BCS 223**   **P:02 C: 01**

Software Required: Turbo C++

Course Contents:

- Creation of objects in programs and solving problems through them.

- Different use of private, public member variables and functions and friend functions.

- Use of constructors and destructors.

- Operator overloading

- Use of inheritance in and accessing objects of different derived classes.

- Polymorphism and virtual functions (using pointers).

- File handling.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

ENGINEERING MECHANICS LAB

Course Code: BME 224   **P:02 C: 01**

Course Contents:

- To verify the law of Force Polygon.

- To verify the law of Moments using Parallel Force apparatus. (Simply supported type)

- To determine the co-efficient of friction between wood and various surface (like Leather, Wood, Aluminum) on an inclined plane.

- To find the forces in the members of Jib Crane.

- To determine the mechanical advantage, Velocity ratio and efficiency of a screw jack.

- To determine the mechanical advantage, Velocity ratio and Mechanical efficiency of the Wheel and Axle

- To determine the MA, VR, η of Worm Wheel (2-start)

- Verification of force transmitted by members of given truss.

- To verify the law of moments using Bell crank lever

- To find CG and moment of Inertia of an irregular body using Computation method

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

ENGINEERING GRAPHICS LAB

Course Code: BME 225   P:02 C: 01

List of Experiments:

- Sketching and drawing of scale & Curve

- Sketching and drawing of Cycloidal Curve

- Sketching and drawing of Involute & Spirals

- Sketching and drawing of points & line

- Sketching and drawing of projection of planes

- Sketching and drawing of projection of solids

- Sketching and drawing of intersection of surfaces

- Sketching and drawing of development of surfaces

- Sketching and drawing of orthographic and isometric projection

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text & References:

- M.B. Shah & B.C. Rana, Engineering Drawing, Pearson Education, 2007
- PS Gill, Engineering Drawing, Kataria Publication
- ND Bhatt, Engineering Drawing, Charotar publications
- N Sidheshwar, Engineering Drawing, Tata McGraw Hill
- CL Tanta, Mechanical Drawing, "Dhanpat Rai"

ENGLISH

Course Code: BCS 201   **C: 03**

Course Objective:

The course is intended to give a foundation of English Language. The literary texts are indented to help students to inculcate creative & aesthetic sensitivity and critical faculty through comprehension, appreciation and analysis of the prescribed literary texts. It will also help them to respond form different perspectives.

Course Contents:

Module I: Vocabulary
Use of Dictionary
Use of Words: Diminutives, Homonyms & Homophones

Module II: Essentials of Grammar - I
Articles
Parts of Speech
Tenses

Module III: Essentials of Grammar - II
Sentence Structure
Subject -Verb agreement
Punctuation

Module IV: Communication
The process and importance
Principles & benefits of Effective Communication

Module V: Spoken English Communication
Speech Drills
Pronunciation and accent
Stress and Intonation

Module VI: Communication Skills - I
Developing listening skills
Developing speaking skills

Module VII: Communication Skills - II
Developing Reading Skills
Developing writing Skills

Module VIII: Written English communication
Progression of Thought/ideas
Structure of Paragraph
Structure of Essays

Module IX: Short Stories
Of Studies, by Francis Bacon
Dream Children, by Charles Lamb
The Necklace, by Guy de Maupassant
A Shadow, by R.K. Narayan
Glory at Twilight, Bhabani Bhattacharya

Module X: Poems

All the Worlds a Stage	Shakespeare
To Autumn	Keats
O! Captain, My Captain.	Walt Whitman
Where the Mind is Without Fear	Rabindranath Tagore
Psalm of Life	H.W. Longfellow

Examination Scheme:

Components	A	CT	HA	EE
Weightage (%)	05	15	10	70

Text & References:

- Madhulika Jha, Echoes, Orient Long Man.
- Ramon & Prakash, Business Communication, Oxford.
- Sydney Greenbaum Oxford English Grammar, Oxford.
- Successful Communications, Malra Treece (Allyn and Bacon).
- Effective Technical Communication, M. Ashraf Rizvi.

BEHAVIOURAL SCIENCE - II
(PROBLEM SOLVING AND CREATIVE THINKING)

Course Code: **BSS 204**   **C: 01**

Course Objective:
To enable the students:
* Understand the process of problem solving and creative thinking.
* Facilitation and enhancement of skills required for decision-making.

Course Contents:

Module I: Thinking as a tool for Problem Solving
What is thinking: The Mind/Brain/Behaviour
Critical Thinking and Learning:
Making Predictions and Reasoning
Memory and Critical Thinking
Emotions and Critical Thinking
Thinking skills

Module II: Hindrances to Problem Solving Process
Perception
Expression
Emotion
Intellect
Work environment

Module III: Problem Solving
Recognizing and Defining a problem
Analyzing the problem (potential causes)
Developing possible alternatives
Evaluating Solutions
Resolution of problem
Implementation
Barriers to problem solving:
Perception
Expression
Emotion
Intellect
Work environment

Module IV: Plan of Action
Construction of POA
Monitoring
Reviewing and analyzing the outcome

Module V: Creative Thinking
Definition and meaning of creativity
The nature of creative thinking
Convergent and Divergent thinking
Idea generation and evaluation (Brain Storming)
Image generation and evaluation
Debating
The six-phase model of Creative Thinking: ICEDIP model

Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Examination Scheme:

Components	SAP	A	Mid Term Test (CT)	VIVA	Journal for Success (JOS)
Weightage (%)	20	05	20	30	25

Text & References:

- Michael Steven: How to be a better problem solver, Kogan Page, New Delhi, 1999
- Geoff Petty: How to be better at creativity; Kogan Page, New Delhi, 1999
- Richard Y. Chang and P. Keith, Kelly: Wheeler Publishing, New Delhi, 1998.
- Phil Lowe Koge Page: Creativity and Problem Solving, New Delhi, 1996
- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 3, Management (1996); Pfeiffer & Company
- Bensley, Alan D.: Critical Thinking in Psychology – A Unified Skills Approach, (1998), Brooks/Cole Publishing Company.

FRENCH - II

Course Code: FLF 201   **C: 02**

Course Objective:

To enable the students to overcome the fear of speaking a foreign language and take position as a foreigner speaking French.
To make them learn the basic rules of French Grammar.

Course Contents:

Module A: pp.38 – 47: Unité 3: Object if 3, 4, 5. 6

Module B: pp. 47 to 75 Unité 4, 5

Contenu lexical:	**Unité 3: Organiser son temps**

        Unité 3: Organiser son temps
1. donner/demander des informations sur un emploi du temps, un horaire SNCF – Imaginer un dialogue
2. rédiger un message/ une lettre pour …
   i) prendre un rendez-vous/ accepter et confirmer/ annuler
   ii) inviter/accepter/refuser
3. Faire un programme d'activités
   imaginer une conversation téléphonique/un dialogue
   Propositions- interroger, répondre

    Unité 4: Découvrir son environnement
1. situer un lieu
2. s'orienter, s'informer sur un itinéraire.
3. Chercher, décrire un logement
4. connaître les rythmes de la vie

    Unité 5: s'informer
1. demander/donner des informations sur un emploi du temps passé.
2. donner une explication, exprimer le doute ou la certitude.
3. découvrir les relations entre les mots
4. savoir s'informer

Contenu grammatical:
1. Adjectifs démonstratifs
2. Adjectifs possessifs/exprimer la possession à l'aide de :
   i. « de » ii. A+nom/pronom disjoint
3. Conjugaison pronominale – négative, interrogative - construction à l'infinitif
4. Impératif/exprimer l'obligation/l'interdiction à l'aide de « il faut…. »/ «il ne faut pas… »
5. passé composé
6. Questions directes/indirectes

Examination Scheme:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- le livre à suivre : Campus: Tome 1

GERMAN – II

Course Code: **FLG 201**   **C: 02**

Course Objective:

To enable the students to converse, read and write in the language with the help of the basic rules of grammar, which will later help them to strengthen their language.
To give the students an insight into the culture, geography, political situation and economic opportunities available in Germany
Introduction to Grammar to consolidate the language base learnt in Semester I

Course Contents:

Module I: Everything about Time and Time periods
Time and times of the day.
Weekdays, months, seasons.
Adverbs of time and time related prepositions

Module II: Irregular verbs
Introduction to irregular verbs like to be, and others, to learn the conjugations of the same, (fahren, essen, lessen, schlafen, sprechen und ähnliche).

Module III: Separable verbs
To comprehend the change in meaning that the verbs undergo when used as such
Treatment of such verbs with separable prefixes

Module IV: Reading and comprehension
Reading and deciphering railway schedules/school time table
Usage of separable verbs in the above context

Module V: Accusative case
Accusative case with the relevant articles
Introduction to 2 different kinds of sentences – Nominative and Accusative

Module VI: Accusative personal pronouns
Nominative and accusative in comparison
Emphasizing on the universal applicability of the pronouns to both persons and objects

Module VII: Accusative prepositions
Accusative propositions with their use
Both theoretical and figurative use

Module VIII: Dialogues
Dialogue reading: 'In the market place'
                  'At the Hotel'

Examination Scheme:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- Wolfgang Hieber, Lernziel Deutsch
- Hans-Heinrich Wangler, Sprachkurs Deutsch
- Schulz Griesbach, Deutsche Sprachlehre für Ausländer
- P.L Aneja, Deutsch Interessant- 1, 2 & 3
- Rosa-Maria Dallapiazza et al, Tangram Aktuell A1/1,2
- Braun, Nieder, Schmöe, Deutsch als Fremdsprache 1A, Grundkurs

SPANISH – II

Course Code: **FLS 201**   **C: 02**

Course Objective:

To enable students acquire more vocabulary, grammar, Verbal Phrases to understand simple texts and start describing any person or object in Simple Present Tense.

Course Contents:

Module I
Revision of earlier modules.

Module II
Some more AR/ER/IR verbs. Introduction to root changing and irregular AR/ER/IR ending verbs

Module III
More verbal phrases (eg, Dios Mio, Que lastima etc), adverbs *(bueno/malo, muy, mucho, bastante, poco)*. Simple texts based on grammar and vocabulary done in earlier modules.

Module IV
Possessive pronouns

Module V
Writing/speaking essays like my friend, my house, my school/institution, myself….descriptions of people, objects etc, computer/internet related vocabulary

Examination Scheme:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- Español, En Directo I A
- Español Sin Fronteras

CHINESE – II

Course Code: **FLC 201**   **C: 02**

Course Objective:

Chinese is a tonal language where each syllable in isolation has its definite tone (flat, falling, rising and rising/falling), and same syllables with different tones mean different things. When you say, "ma" with a third tone, it mean horse and "ma" with the first tone is Mother. The course aims at familiarizing the student with the basic aspects of speaking ability of Mandarin, the language of Mainland China. The course aims at training students in practical skills and nurturing them to interact with a Chinese person.

Course Contents:

Module I
Drills
Practice reading aloud
Observe Picture and answer the question.
Tone practice.
Practice using the language both by speaking and by taking notes.
Introduction of basic sentence patterns.
Measure words.
Glad to meet you.

Module II
Where do you live?
Learning different colors.
Tones of "bu"
Buying things and how muchit costs?
Dialogue on change of Money.
More sentence patterns on Days and Weekdays.
How to tell time. Saying the units of time in Chinese. Learning to say useful phrases like – 8:00, 11:25, 10:30
P.M. everyday, afternoon, evening, night, morning 3:58, one hour, to begin, to end ….. etc.
Morning, Afternoon, Evening, Night.

Module III
Use of words of location like-li, wais hang, xia
Furniture – table, chair, bed, bookshelf,.. etc.
Description of room, house or hostel room.. eg what is placed where and how many things are there in it?
Review Lessons – Preview Lessons.
Expression 'yao", "xiang" and "yaoshi" (if).
Days of week, months in a year etc.
I am learning Chinese. Is Chinese difficult?

Module IV
Counting from 1-1000
Use of "chang-chang".
Making an Inquiry – What time is it now? Where is the Post Office?
Days of the week. Months in a year.
Use of Preposition – "zai", "gen".
Use of interrogative pronoun – "duoshao" and "ji".
"Whose"??? Sweater etc is it?
Different Games and going out for exercise in the morning.

Module V
The verb "qu"
 – Going to the library issuing a book from the library
 – Going to the cinema hall, buying tickets
 – Going to the post office, buying stamps
 – Going to the market to buy things.. etc
 – Going to the buy clothes …. Etc.
Hobby. I also like swimming.
Comprehension and answer questions based on it.

Examination Scheme:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- "Elementary Chinese Reader Part I" Lesson 11-20