First Year Curriculum for
Undergraduate Degree Courses in Engineering & Technology

A. Programs offered at undergraduate Level –

1. Chemical Engineering 2. Computer Engineering 3. Mechanical Engineering 4. Electrical Engineering 5. Environmental Science and Technology. 6. Chemical Technology

B. Structure of curriculum

Mandatory Induction Program

3 weeks duration
• Physical activity • Creative Arts • Universal Human Values (UHV-1) • Literary • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./Branch & Innovations

Semester I and II (First year)
Courses Common to all branches of UG Engineering & Technology

Sr. No	Category	Course Code	Course Title	Hours per week			Total Hours	Credits	E	M	I	V	Total
				L	T	P							
1	Basic Science course	MH2104 / CO2101	Engineering Chemistry / Programming in C++ #	3	0	2	5	4	70	30	20	30	150
2	Basic Science course	MH2111	Engineering Physics	3	0	2	5	4	70	30	20	30	150
3	Basic Science course	MH2109	Mathematics –I	3	2	0	5	5	70	30	50	0	150
4	Engineering Science Courses	MH2102	Basic Electrical Engineering	3	0	2	5	4	70	30	20	30	150
5	Engineering Science Courses	MH2106	Engineering Graphics	1	0	4	5	3	70	30	20	30	150
6	Engineering Science Courses	MH2103	Basic Mechanical Engineering	3	0	2	5	4	70	30	20	30	150
7	Engineering Science Courses	MH2101	Basic Civil Engineering	3	0	2	5	4	70	30	20	30	150

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8	Basic Science courses	MH2110	Mathematics –II	3	2	0	5	5	70	30	50	0	150
9	Engineering Science Courses	MH2112	Programming for Problem Solving	3	0	2	5	4	70	30	20	30	150
10	Engineering Science Courses	MH2113	Workshop Practices	0	0	4	4	2	0	0	20	80	100
11	Humanities and Social Sciences including Management courses	MH2107	English	2	0	2	4	3	70	30	20	30	150
12	Humanities and Social Sciences including Management courses	MH2105	India Constitution	1	0	0	1	1	50	0	0	0	50
13	Engineering Science Courses	MH2108	Environmental Studies & Sustainability	1	0	0	1	1	50	0	0	0	50
TOTAL				**29**	**4**	**22**	**55**	**44**	**800**	**300**	**280**	**320**	**1700**

 # Programming in C++ (CO2101) will be included in 2nd Semester Computer Engineering instead of Engineering Chemistry (MH2104), w.e.f. A.Y. 2023-24.

C. Course code and definition:

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
E	Theory External Examination Marks
M	Theory Internal Examination Marks
I	Practical Internal Examination Marks
V	Practical External Examination Marks

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UPL University of Sustainable Technology

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: MH2104
Subject Name: Engineering Chemistry

Semester: - I/II

Type of course: Basic Science Course

Prerequisite: Zeal to learn the subject

Rationale: Chemistry is considered as Basic Science subject

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**General Chemistry**: Types of chemical bond: Ionic bond, Covalent bond, Hydrogen bond, Twelve Principle of Green Chemistry, Normality, Molarity, Molality, Preparation of Solutions	**5**
2	**Water Technology**: Introduction, Hardness of Water, Types of Hardness, Scale & Sludge, Boiler Corrosion, Caustic Embrittlement, Softening of water: EDTA method, Lime soda Process, Zeolite Process, Treatment of Domestic water, Industrial Waste Water, Desalination of Brackish water method: RO Process	**7**
3	**Metal, Alloy & Corrosion**: Physical Properties of Metal, Alloy & need of Alloying metals, Introduction to Corrosion, Dry Corrosion, Wet Corrosion, Galvanic Corrosion, Differential Aeration Corrosion, Corrosion control: Cathodic Protection Method, Coating, Inhibitor	**7**
	SECTION-B	
4	**Polymers and Rubber**: Introduction, Classification based on Source, Structure, Molecular forces, Polymerization and its mechanism, Definition of Rubber, Types of Rubber, Vulcanization of rubber, Application of Rubber, Biodegradable Polymers, Commercially	**7**

	important polymers- PE, PP, PS, PVC	
5	**Fuel and Combustion**: Introduction, Types of fuel and their applications, Calorific Value, Characteristics of good fuel, Analysis of coal – ultimate and proximate analysis, LPG, Natural gas, Biogas, Refining of Petroleum by Fractional distillation, Octane and Cetane Number.	**5**
6	**Analytical Techniques**: Measurement and understanding of pH, Conductance, UV-Visible Spectroscopy and its Application, IR Spectroscopy and its application.	**5**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**20**	**30**	**20**	**10**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Text Books:

1. A text book of Applied Chemistry by J. Rajaram, Tata McGraw Hill Co. New Delhi
2. A textbook of Engineering Chemistry by Shashi Chawla, Dhanpatrai Publishing Co. Ltd.

Reference Books:

1. Engineering Chemistry by Jain and Jain, Dhanpat Rai Publishing Co.
2. Engineering Chemistry Willey India Publisher
3. Engineering Chemistry by Marry Jane & Shultz, Cencage Learning Publisher
4. Engineering Chemistry by N. Krishnamurthy, P. Vallinaygam and D. Madhavan, 1. Prentice Hall of India Pvt. Ltd.
5. Engineering Chemistry by K. Sesha Maheswaramma and Mridula Chugh, Pearson India Education Pvt Ltd.
6. Engineering Chemistry by B K. Sharma, Krishna Prakashan Media (P) Ltd.
7. Essential of Physical Chemistry by Bahl and Tuli., S Chand & Co. Ltd, New Delhi.
8. Fundamentals of Computing and Programming in C, First Edition, by Pradip Dey, Manas Ghosh, Oxford University Press, 2009

Bachelor of Engineering
Subject Code: MH2104
Subject Name: Engineering Chemistry

List of Practicals: (Any Ten)

1. Determine the strength of given acidic solution using standard solution of base
2. Analysis of Steel Sample.
3. Analysis of Brass Alloy.
4. Estimation of Hardness.
5. Gravimetric Analysis of decomposition of Na2CO3 & NaHCO3.
6. To study Wet Corrosion loss of Steel by weight loss method using electrochemical theory.
7. Stress Corrosion Cracking of Brass in NH3 Solution.
8. To determine Alkalinity of a given Water Sample.
9. Determination of Saponification Value of Oil.
10. Determination of chloride content of water
11. Study of decomposition reaction of ZnCO3 by Gravimetric analysis.
12. To determine the moisture content in coal.
13. VLAB/DEMO Practical: Instrumentation of pH meter
14. VLAB/DEMO Practical: Instrumentation of UV spectroscopy
15. VLAB/DEMO Practical: Instrumentation of IR spectroscopy

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Define** the types of chemical bonding, preparation of basic solutions
CO-2	**Understand** the importance of Water technology in daily life
CO-3	**Apply** knowledge of corrosion chemistry to protect metals
CO-4	**Analyze** the properties of various type of rubber for specific purpose
CO-5	**Compare** the properties & application of various fuels for specific purpose
CO-6	**Choose** appropriate spectroscopic technique for structural identification & Purity

List of Open Source Software/learning website:

- Vlabs.iitb.ac.in
- NPTEL videos
- https://vlab.amrita.edu/

UPL University of Sustainable Technology

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: MH2111
Subject Name: Engineering Physics

Semester: - I/II

Type of course: Basic Science course

Prerequisite: Basic Understanding of Physics

Rationale: The basic science physics program is to understand the students for power lies in the use of a comparatively small number of assumptions, models, laws and theories to explain a wide range of phenomena, from the incredibly small to the incredibly large. Physics has helped to unlock the mysteries of the universe and provides the foundation of understanding upon which modern technologies and all other sciences are based.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE(E)	PA(M)	ESE(V)	PA(I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Unit-1 Types of electronic materials:** Metals, semiconductors, and insulators; Density of states and energy band diagrams, E-k diagram, Direct and indirect band gaps, Fermi level and Fermi Energy, Free electron theory of metals, Kronig- Penney Model	7
2	**Unit-2 Semiconductors:** Properties of semiconductors, Types of semiconductors: Intrinsic and extrinsic semiconductors (N- type and P- type), Carrier concentration, Law of mass action, Mobility and conductivity, Carrier generation and recombination, Carrier transport: Diffusion and Drift, Characteristics of p-n junction diode, Energy band diagram of p-n junction diode	7
3	**Unit-3 Resistivity measurements:** Resistivity, Four probe method: for bulk material and for thin sheet, advantage and applications; Vander Pauw measurement, Hall effect and Hall coefficient, Hot point probe measurement, Capacitance Voltage	6

Bachelor of Engineering
Subject Code: MH2111
Subject Name: Engineering Physics

	measurement, Deep Level Transient Spectroscopy (DLTS), UV- Vis Spectroscopy	
SECTION-B		
4	**Unit-4 Superconductivity:** Introduction of superconductivity, Properties of superconductor: Effect of magnetic field, Meissner effect, Isotopic mass effect, Electrical resistance. Critical temperature, Critical magnetic field, Critical current density, Type- I and Type- II superconductors, Applications of super conductors, BCS theory, Cooper pairs	**6**
5	**Unit-5 Force and Motion:** Recapitulation of equations of motion, Newton's Ist law of motion, Force, basic forces in motion, gravitational force, electrostatic force, electromagnetic force, nuclear force, Inertia, types of inertia (inertia of rest, inertia of motion, inertia of direction), Momentum, Newton's IInd law of motion, measurement of force using second law, simple problems on F = ma and equations of motion, Impulse of force, Impulse as the product of force and time, impulse as the difference of momentum, examples of impulse, simple problems on impulse, Newtons III rd law of motion and its examples. Law of conservation of momentum, Statement, simple problems.	**7**
6	**Unit-6 Fundamentals of Waves** Properties Of Light, Electromagnetic spectrum, Reflection, refraction, snell's law, diffraction, polarization, interference of light, constructive and destructive interference (Only definitions), physical significance of refractive index, dispersion of light LASER, Properties of laser, spontaneous and stimulated emission, population inversion, optical pumping, construction and working of He-Ne laser, applications of lasers.	**7**

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30	**50**	**20**	**-**	**-**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Bachelor of Engineering
Subject Code: MH2111
Subject Name: Engineering Physics

Text Books:

1. Engineering Physics, Malik and Singh, Tata Mc Graw Hill
2. Engineering Physics, Naidu, Pearson

Reference Books:

1. Halliday & Resnick, Physics, Wiley India
2. Sears And Zemansky, University Physics, Pearson Publication
3. Engineering Physics by Dattu R Joshi, McGraw hill Publications

List of Practical:

1. Determination of charge carrier density with the Hall-Effect.
2. To plot I- V characteristics of p-n junction diode.
3. To plot the I-V Characteristic of LED.
4. To plot the characteristics of half wave and full wave rectifier.
5. To perform Bridge Rectifier by using P-N Junction diode.
6. To measurement of the resistivity of given materials in Virtual lab.
7. To measure different electrical and electronics quantities in Cathode Ray Oscilloscope (CRO).
8. To plot and get phase difference between two waveforms.
9. To measure time period of waveform on Cathode Ray Oscilloscope.
10. To determine the resistivity of semiconductors by Four probe Method in V-Lab.

Bachelor of Engineering
Subject Code: MH2111
Subject Name: Engineering Physics

Course Outcomes:

Sr. No.	CO statement
CO-1	The student will **gain** knowledge of basic theoretical and mathematical concept of electronic materials.
CO-2	The student will **understanding** properties and applications associated with semiconducting materials.
CO-3	The student will **demonstrate** understanding of basic theory, properties and applications of Superconductivity.
CO-4	The student will **gain** knowledge of the different measurements techniques to characterize various semiconducting materials and devices.
CO-5	The student should **understand** the significance of Newton's law of inertia by identifying and refuting classic misconceptions concerning the causes of motion.
CO-6	The student will **demonstrate** understanding of basic theory, properties and applications of Superconductivity.

List of Open Source Software/learning website:

- www.vlab.co.in

UPL University of Sustainable Technology

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: MH2109
Subject Name: Mathematics-1

Semester: - I

Type of course: Engineering Science

Prerequisite: Algebra, Geometry & Pre-Calculus till 12th Standard level

Rationale: The study of rate of changes, understanding to express the function in terms of series, to apply matrix algebra.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	2	0	5	70	30	0	50	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Matrix:** Elementary row operations in Matrix, Row echelon and reduced row echelon forms, Rank by echelon forms, Inverse by Gauss-Jordan method, Solution of system of linear equations by Gauss elimination and Gauss Jordan methods, Eigen values and Eigen vectors, Cayley-Hamilton theorem.	10
2	**Improper Integrals :** Definition of Improper Integrals, Types of Improper Integrals, Convergence and divergence of the integrals	4
3	**Beta and Gamma functions**: Definition of Beta and Gamma functions, Properties of Beta and Gamma functions, Relation between Beta and Gamma function (without proof).	4
	SECTION-B	
4	**Sequence and Series :**Convergence and divergence of sequences, The Sandwich Theorem for Sequences, The Continuous Function Theorem for Sequences, Bounded Monotonic Sequences, Convergence and divergence of an infinite series, geometric series, n^{th} term test for divergent series, Combining series, Harmonic Series, The p - series, The	10

Bachelor of Engineering
Subject Code: MH2109
Subject Name: Mathematics-1

	Comparison test, The Limit Comparison test, Ratio test, Root test, Alternating series test, Absolute and Conditional convergence, Power series, Radius of convergence of a power series, Taylor and Maclaurin series.	
5	**Indeterminate Forms :** L'Hospital's Rule, Indeterminate Forms : $\frac{0}{0}, \frac{\infty}{\infty}, \infty \cdot 0, \infty - \infty, 0^0, \infty^0, 1^\infty$	3
6	**Ordinary Differential Equations of first order :** Differential Equations, Ordinary Differential Equations of First Order and First Degree, Variable separable, Homogeneous differential equations, Nonhomogeneous differential equations, Exact differential equations, Non-exact differential equations reducible to exact form, Linear differential equations, Nonlinear differential equations reducible to linear form, Applications of First-Order Differential Equations : Orthogonal trajectories	5

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**30**	**30**	**20**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Text Books:

1. Ravish R Singh & Mukul Bhatt, Mathematics-II, Mc Graw Hill Education Pvt Limited (2019)

2. Dr. H.C. Patel, Dr. A.R. Patel & Dr. Atul Patel, Mathematics-I, Mahajan Publication, 2nd Edition (2019-20)

Reference Books:

1. Maurice D. Weir, Joel Hass, Thomas' Calculus, Early Transcendental, 13e, Pearson, 2014.
2. Howard Anton, Irl Bivens, Stephens Davis, Calculus, 10e, Wiley, 2016.

Bachelor of Engineering
Subject Code: MH2109
Subject Name: Mathematics-1

3. James Stewart, Calculus: Early Transcendental with Course Mate, 7e, Cengage, 2012
4. Anton and Rorres, Elementary Linear Algebra, Applications version, Wiley India Edition.
5. T. M. Apostol, Calculus, Volumes 1 & 2, Wiley Eastern.

List of tutorials:

1. Tutorial-1 (Matrix)
2. Tutorial-2 (Matrix)
3. Tutorial-3 (Improper Integrals)
4. Tutorial-4 (Beta and Gamma functions)
5. Tutorial-5 (Sequence and Series)
6. Tutorial-6 (Sequence and Series)
7. Tutorial-7 (Sequence and Series)
8. Tutorial-8 (Indeterminate Forms)
9. Tutorial-9 (Ordinary Differential Equations of first order)
10. Tutorial-10 (Ordinary Differential Equations of first order)

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Define** matrix, Beta & Gamma functions, sequence and series.
CO-2	**Explain** types of improper integral, use of Gauss-elimination & Gauss-Jordan method.
CO-3	**Calculate** rank of matrix, convergence and divergence of sequence and series.

Bachelor of Engineering
Subject Code: MH2109
Subject Name: Mathematics-1

CO-4	**Analyze** the indeterminate forms, different tests for series.
CO-5	**Evaluate** solution of differential equation of first order & first degree.
CO-6	**Solve** Indeterminate Forms, system of linear equations.

List of Open Source Software/learning website:

- https://nptel.ac.in
- www.sosmath.com

UPL University of Sustainable Technology

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: MH2102
Subject Name: Basic Electrical Engineering

Semester: - I/II

Type of course: Engineering Science Courses

Prerequisite: NA

Rationale: The basic idea of the course to provide comprehensive idea about AC and D C circuit analysis, working principles and applications of basic machines in electrical engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Unit-1 DC Circuits:** Electrical circuit elements (R, L and C), Temperature Coefficient of Resistance, voltage and current sources, star to delta & delta to star conversion, Source transformation, Kirchoff's current and voltage laws, Analysis of simple circuits with dc excitation. Mesh and Nodal analysis. Superposition, Thevenin and Norton Theorems.	**8**
2	**Unit-2 Magnetism and Electromagnetism:** Magnetization and Magnetic Circuit. Magnetic effect of electric current, cross and dot convention, Force on current carrying conductor placed in magnetic field, Fleming's left hand rule. , Law of Electromagnetic induction, Leakage flux, Magnetization curve, statically induced e.m.f., Self and Mutual Inductance. Magnetic materials, BH characteristics, Comparison between Electric & Magnetic Circuit.	**8**
3	**Unit-3 Electronic Devices:** Diodes, BJT, FET, MOSFET, Rectifiers and filters. Number systems, Logic gates, Combinational logic, Flip-flops. Concept of modulation – AM, FM and Digital communication.	**6**

Bachelor of Engineering
Subject Code: MH2102
Subject Name: Basic Electrical Engineering

SECTION-B		
4	**Unit-4 AC Circuits:** Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections. Power measurement in three phase circuits	**10**
5	**Unit-5 Electrical Machines:** Working principles & Construction of DC generator, DC motor, Transformer, Three phase Induction Motor.	**6**
6	**Unit-6 Electrical Installations :** Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.	**6**

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
40	**20**	**20**	**20**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Text Books:

1. B. L. Theraja, "Electrical Technology – Part I and II", S. Chand and Co. 2012.
2. V. K. Mehta, "Basic Electrical Engineering", S. Chand Company Ltd., New Delhi

Reference Books:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. V. N. Mittal and Arvind Mittal;, " Basic Electrical Engineering" McGraw Hill
3. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
4. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

Bachelor of Engineering
Subject Code: MH2102
Subject Name: Basic Electrical Engineering

List of Practical:

1. To verify Kirchhoff's Current Law and Kirchhoff's Voltage Law in D.C. circuits.
2. To Verify Thevenin's theorem and obtain Thevenin's equivalent circuit for the given network.
3. To Verify Norton's theorem and obtain Norton's equivalent circuit for the given network.
4. To Verify Superposition theorem and obtain Superposition equivalent circuit for the given network.
5. To determine the impedance and plot the phasor diagram of R-L - C series circuit.
6. To Verify Series Resonance Circuit.
7. To study the various cut section models of Electrical Machines
8. To Measure the three phase power by two wattmeter method.
9. To verify the application of Diode.
10. To verify Staircase, Go-down and tube light wiring connection practice and its application.

Course Outcomes:

Sr. No.	CO statement
CO-1	**State** the concepts of basic Laws such as Ohm's Law and Kirchhoff's Law, star delta transformation for solving resistive series, parallel and series-parallel circuits.
CO-2	**Understand** the basic concepts of magnetic circuits, electro magnetism and electrostatics.
CO-3	**Explain** the Basics of Electronic Circuits.
CO-4	**Apply** the concepts of AC Quantities in the mathematical operation on AC waveforms and to draw pharos diagram and waveforms for purely resistive, purely inductive and purely capacitive as well as series and parallel R-L-C circuits.
CO-5	**Discuss** the working principle of Electrical Machines and Transformer.
CO-6	**Summaries** the concept of battery, Wires, Cables, lamps, fixtures and reflectors. Explain the importance of safety and the precaution to be taken while working with electrical equipment.

Bachelor of Engineering
Subject Code: MH2102
Subject Name: Basic Electrical Engineering

List of Open Source Software/learning website:

- www.vlabs.co.in
- NPTL Video Lectures

UPL University of Sustainable Technology

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: MH2106
Subject Name: Engineering Graphics

Semester: - I /II

Type of course: Engineering Science

Prerequisite: Zeal to learn the subject

Rationale: Engineering Drawing is an effective language of engineers. It is the foundation block which strengthens the engineering & technological structure. Moreover, it is the transmitting link between ideas and realization.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
1	-	4	3	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction to Engineering Graphics:** Drawing instruments and accessories, BIS – SP 46. Use of plane scales, Diagonal Scales and Representative Fraction **Loci of Points:** Path of the points moving on Simple mechanisms, Slider crank mechanism, Four bar mechanism	**5**
2	**Engineering Curves:** Classification and application of Engineering Curves, Construction of Conics, Cycloidal Curves, Involutes and Spirals along with normal and tangent to each curve	**10**
3	**Projections of Points and Lines:** Introduction to principal planes of projections, Projections of the points located in same quadrant and different quadrants, Projections of line with its inclination to one reference plane and with two reference planes. True length and inclination with the reference planes **Projections of Planes:** Projections of planes (polygons, circle and ellipse) with its inclination to one reference plane and with two reference planes, Concept of auxiliary plane method for projections of the plane	**15**

Bachelor of Engineering
Subject Code: MH2106
Subject Name: Engineering Graphics

	Projections of Solids, Section of Solids and Development of Surfaces: Classification of solids. Projections of solids (Cylinder, Cone, Pyramid and Prism) along with frustum with its inclination to one reference plane and with two reference planes, Section of such solids and the true shape of the section, Development of surfaces	
SECTION-B		
4	**Orthographic Projections:** Fundamental of projection along with classification, Projections from the pictorial view of the object on the principal planes for view from front, top and sides using first angle projection method and third angle projection method, full sectional view	**15**
5	**Isometric Projections and Isometric View or Drawing:** Isometric Scale, Conversion of orthographic views into isometric projection, isometric view or drawing of simple objects	**10**
6	**Computer Aided Drawing:** Introduction to AutoCAD, Basic commands for 2D drawing like: Line, Circle, Polyline, Rectangle, Hatch, Fillet, Chamfer, Trim, Extend, Offset, Dim style, etc..	**5**

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
NA	**NA**	**NA**	**NA**	**NA**	**NA**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Text Books:

1. **A Text Book of Engineering Graphics** by P.J.Shah S.Chand & Company Ltd., New Delhi
2. **A Text book of Engineering Drawing** by R.K.Dhawan, S.Chand & Company Ltd., New Delhi

Reference Books:

1. Elementary Engineering Drawing by N.D.Bhatt Charotar Publishing House, Anand
2. Engineering Drawing by Jolhe D A, Tata McGraw Hill Edu. New Delhi,

Bachelor of Engineering
Subject Code: MH2106
Subject Name: Engineering Graphics

List of Practical/ tutorials: (Practical's – 10)

1. Practice sheet (which includes dimensioning methods, different types of line, construction of different polygon, divide the line and angle in parts, use of stencil)
2. Problem based on Plane scale and diagonal scale
3. Problem based on Loci of points
4. Problem based on Engineering curves
5. Problem based on Projection of line
6. Problem based on Projection of plane
7. Problem based on Projection of solid, section of solid and development of surfaces
8. Problem based on Orthographic projection
9. Problem based on Isometric projection
10. Problem based on orthographic drawing (three views) using above mentioned AutoCAD commands.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Know** and understand the conventions and the methods of engineering drawing.
CO-2	**Interpret** engineering drawings using fundamental technical mathematics.
CO-3	**Construct** basic and intermediate geometry and comprehend the theory of projection
CO-4	**Improve** their visualization skills so that they can apply these skills in developing new products.
CO-5	**Develop** their technical communication skill in the form of communicative drawings.
CO-6	**Use** computer software for engineering drawing.

List of Open Source Software/learning website:

- NPTEL tutorials
- https://www.youtube.com/watch?v=dmt6_n7Sgcg
- https://www.youtube.com/watch?v=fvjk7PlxAuo
- http://www.me.umn.edu/coursesme2011/handouts/engg%20graphics.pdf

UPL University of Sustainable Technology

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: MH2103
Subject Name: Basics of Mechanical Engineering

Semester: - I / II

Type of course: Engineering Science Course

Prerequisite: Knowledge of Physics and Mathematics

Rationale: To provide a comprehensive knowledge of fundamental concept of mechanical engineering for the students of varied branches of Engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction:-** Prime movers and its types, Concept of Force, Pressure, Energy, Work, Power, System, Heat, Temperature, Specific heat capacity, Change of state, Path, Process, Cycle, Internal energy, Enthalpy, Statements of Zeroth law, First Law of Thermodynamics and Second Law of Thermodynamics, Introduction and applications of Energy sources like Fossil fuels, Nuclear fuels, Hydro, Solar, Wind, and Bio-fuels, Environmental issues like Global warming and Ozone depletion	**03**
2	**Properties of Gases:** Boyle's law, Charles's law, Gay-Lussac's law, Avogadro's law, Combined gas law, Gas constant, Relation between Cp and Cv, Various non-flow processes like constant volume process, constant pressure process, Isothermal process, Adiabatic process, Polytropic process **Properties of Steam:** Steam formation, Types of steam, Enthalpy, Specific volume, Internal energy and dryness fraction of steam, use of steam tables, steam calorimeters	**10**
3	**Steam Boilers:** Introduction, Classification, Cochran, Lancashire and Babcock and Wilcox boiler, Functioning of different mountings and accessories	**05**

Bachelor of Engineering
Subject Code: MH2103
Subject Name: Basics of Mechanical Engineering

SECTION-B		
4	**Heat Engines:** Heat engine cycle and Heat engine, working substances, Classification of heat engines, Description and thermal efficiency of Carnot; Rankine; Otto cycle and Diesel cycles **Internal Combustion Engines:** Introduction, Classification, Engine details, four-stroke/ two-stroke cycle Petrol/Diesel engines, Indicated power, Brake Power, Efficiencies	**08**
5	**Pumps:** Types and operation of Reciprocating, Rotary and Centrifugal pumps, Priming **Air Compressors:** Types and operation of Reciprocating and Rotary air compressors, significance of Multistage **Refrigeration & Air Conditioning:** Refrigerant, Vapor compression refrigeration system, Vapor absorption refrigeration system, Domestic Refrigerator, Window and split air conditioners	**07**
6	**Engineering Materials:** Types, properties and applications of Ferrous & Nonferrous metals, Timber, Abrasive material, silica, ceramics, glass, graphite, diamond, plastic and polymer	**03**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10%	**35%**	**15%**	**20%**	**20%**	**NA**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels

Textbooks:

1. Basics of Mechanical Engineering by Dr. R.K.Shukla, Tech-Neo Publications, Pune, Maharashtra.
2. Basics of Mechanical Engineering by H.G.Katariya, J.P.Hadiya & S.M.Bhatt, Books India Publications, Ahmedabad, Gujarat.

Reference Books:

1. Basics of Mechanical Engineering by B.L.Singhal & R.B. Patil, TechKnowledge Publications, Pune, Maharashtra.

2. Elements of Mechanical Engineering by N M Bhatt and J R Mehta, Mahajan Publishing House.
3. Basic Mechanical Engineering by Pravin Kumar , Pearson Education
4. Fundamental of Mechanical Engineering by G.S. Sawhney, PHI Publication New Delhi

List of Practical:

1. To understand construction and working of different types of Steam Calorimeters.
2. To understand construction and working of various types of boilers.
3. To understand construction and working of different boiler mountings.
4. To understand construction and working of different boiler accessories.
5. To understand construction features of two and four stroke Petrol engines.
6. To understand construction features of two and four stroke Diesel engines.
7. To determine brake thermal efficiency of an I. C. Engine.
8. To understand construction and working of different types of Pumps.
9. To understand construction and working of different types of Air compressors.
10. To demonstrate vapour compression refrigeration cycle of Domestic Refrigerator, Window air conditioner and Split air conditioner.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Collect** the basic terminology and various information regarding various source of energy.
CO-2	**Describe** the properties of commonly used working fluids i.e. ideal gases and steam
CO-3	**Apply** fundamental knowledge to solve problems of pump, air compressor and refrigeration system
CO-4	**Analyze** various heat engine cycles and understand construction and working of IC engines
CO-5	**Compile** working and applications of steam boilers and various accessories and mountings of boilers.
CO-6	**Compare** properties of various engineering materials with their applications.

List of Open Source Software/learning website:

Bachelor of Engineering
Subject Code: MH2103
Subject Name: Basics of Mechanical Engineering

- https://nptel.ac.in
- www.vlab.co.in
- www.coursera.org

UPL University of Sustainable Technology

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: MH2101
Subject Name: Basic of Civil Engineering

Semester: - I/II

Type of course: Engineering Science

Prerequisite: Zeal to learn the subject

Rationale: Understanding of basic principles of Engineering is required in various field of engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction to Civil Engineering, Building Materials:** **Introduction to Civil Engineering** : Branches of Civil Engineering, Scope of Civil Engineering, Role of Civil Engineer in Society, Impact of infrastructural development on economy of country, Early constructions and developments over time, Ancient monuments & Modern marvels; **Building Materials:** Introduction to construction materials like Stone, Bricks, Lime, Cement, Timber, Sand, Aggregates, Mortar, Concrete and bitumen.	**5**
2	**Surveying, Leveling and Mapping:** **Introduction:** Definition of Surveying, Aims and applications, Fundamental principles of surveying, Classification of surveying, Plans and maps, Scales, Units of measurement. **Linear Measurement:** Methods, Instruments used in chain surveying, Selection of stations, Chaining, Ranging, Offsetting, Errors in chaining and correction, Conventional symbols, Numericals **Angular Measurement:**	**8**

Bachelor of Engineering
Subject Code: MH2101
Subject Name: Basic of Civil Engineering

	Instruments used, Types of compass, Types of meridians and bearings, Measurement of bearings, computation of angles. Compass traversing and correction of bearings for local attraction, Numericals.	
3	**Leveling:** Aims and applications, Definition of various terms, Instruments for leveling, Methods of leveling, Recording observations in level-book, Computing reduced levels by HI and rise & fall method, Definition of contour, Characteristics of contours of different terrains and application of contour maps, introduction to Global positioning system(GPS), remote sensing(RS) and Geographical information system(GIS), Numericals	**8**
SECTION-B		
4	**Building Construction, Planning:** **Building Construction**: Classification of buildings, Types of loads acting on buildings, Building components and their functions and nominal dimensions. **Planning:** Definition and concept of plan of a simple residential building, Elementary principles and basic requirements for building planning, elevation and section of a residential building.	**8**
5	**Water Resource Engineering** Introduction to dams, weirs, barrages and check dams, Rainfall Conservation, Waste water basic Introduction, treatment process and disposal methods.	**3**
6	**Transportation Engineering:** Role of transportation in national development, Introduction to road traffic and traffic control, Introduction to mass transportation system,	**4**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**30**	**30**	**20**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Text Books:

1. R. P. Rethaliya, "Elements of civil engineering"
2. Dr. R. B. Khasiya, "Basic Civil Engineering"

Reference Books:

Bachelor of Engineering
Subject Code: MH2101
Subject Name: Basic of Civil Engineering

1. Surveying Vol. I, Dr. B. C. Punmia, Ashokkumar Jain, Arun kumar Jain, 16th Edition, Laxmi Publication Delhi.
2. Elements of Civil Engineering, Dr. R.K. Jain and Dr. P.P. Lodha, McGraw Hill Education, India Pvt. Ltd.
3. Building drawing, M.G.Shah, C.M.Kale and S.Y.Patki, Tata McGraw Hill
4. Building Construction, Dr. B. C. Punmia, Ashokkumar Jain, Arunkumar Jain, Laxmi Pub. Delhi.
5. Highway and Traffic Engineering, Khanna and Justo and L.R Kadiyali, S. Chand Publication.

List of Practicals:

1. Unit conversation Exercise.
2. Chart preparation of various materials. Collection of rate and sample. (field visit).
3. Components of building (field visit).
4. Planning of a residential building(plan, elevation& section of simple 1 room)
5. Linear measurements (Chain Survey) (in field with instrument)
6. Angular measurements (Compass Survey) (in field with instrument)
7. Introduction to Theodolite & total station.
8. Determine R.L of given point by Dumpy level. (in field with instrument)
9. Presentation on BRTS / mass transportation system (city bus)
10. Seminar on green building & smart city

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Describe** the use of different materials in Civil Engineering
CO-2	**Translate** the readings of angular and linear measurements in the field book for its understanding.
CO-3	**Use** different equipments for levelling
CO-4	**Identify** various aspect of the building**,** various building components, method of constructions , and services
CO-5	**Develop** water conservation methods, water -waste water quality

	and advances in civil engineering
CO-6	**Evaluate** various public transportation system, and pavements

List of Open Source Software/learning website:

- http://nptel.ac.in/courses/105107122/
- http://nptel.ac.in/courses/105107157/
- http://nptel.ac.in/courses/105101087/
- http://nptel.ac.in/courses/105104100/

UPL University of Sustainable Technology

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: MH2110
Subject Name: Mathematics-II

Semester: - II

Type of course: Engineering Science

Prerequisite: Algebra, Trigonometry, Geometry, Differentiation, Integration

Rationale: The study to compute area, volume and extremum values of functions

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	2	0	5	70	30	0	50	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Ordinary Differential Equation of higher order :** Ordinary differential equations of higher orders, Homogeneous Linear Ordinary differential equations of Higher Order with Constant Coefficients, Nonhomogeneous ODEs Nonhomogeneous Linear Differential Equations of Higher Order with Constant Coefficients, Method of Variation of Parameters, Cauchy's Linear Equations , Legendre's Linear Equations	10
2	**Series Solution of Differential Equations :** Ordinary point & Singular point, Power-Series Method, Series Solution about an Ordinary Point	4
3	**Applications of Definite Integral :** Volume using cross-sections, Length of plane curves, Areas of Surfaces of Revolution	4
	SECTION-B	
4	**Partial Differentiation :** Functions of several variables, Limits and continuity, Test for nonexistence of a limit, Partial differentiation, Differentiability & Chain rule, Implicit differentiation, Euler's method	6

Bachelor of Engineering
Subject Code: MH2110
Subject Name: Mathematics-II

5	**Applications of Partial Differentiation:** Directional derivative, Tangent plane and Normal line, Total differentiation, Local Extreme Values (Maximum and Minimum Values), Extreme Values with Constrained Variables, Method of Lagrange Multipliers.	6
6	**Partial Differential Equation :** Introduction, Formation of Partial Differential Equations, Linear Partial Differential Equations of First Order, Nonlinear Partial Differential Equations of First Order, Homogeneous Linear Partial Differential Equations with Constant Coefficients, Classification of Second Order Linear Partial Differential Equations, Method of Separation of Variables	6

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**30**	**35**	**15**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Text Books:

1. Ravish R Singh & Mukul Bhatt, Advanced Engineering Mathematics, Mc Graw Hill Education Pvt Limited (2015)

2. Dr. H.C. Patel, Dr. A.R. Patel & Dr. Atul Patel, Mathematics-I, Mahajan Publication, 2nd Edition (2019-20)

Reference Books:

1. Introduction to Linear Algebra with Application, Jim Defranza, Daniel Gagliardi, Tata McGraw-Hill
2. Elementary Linear Algebra, Applications version, Anton and Rorres, Wiley India Edition.
3. Advanced Engineering Mathematics, Erwin Kreysig, Wiley Publication.
4. Calculus, Robert T. Smith & Ronald B. Minton, McGraw-Hill
5. Calculus, Volumes 1 and 2, T. M. Apostol, Wiley Eastern

Bachelor of Engineering
Subject Code: MH2110
Subject Name: Mathematics-II

List of tutorials:

1. Tutorial-1 (Ordinary differential equations of higher orders)
2. Tutorial-2 (Ordinary differential equations of higher orders)
3. Tutorial-3 (Series Solution of Differential Equations)
4. Tutorial-4 (Applications of definite integral)
5. Tutorial-5 (Partial Differentiation)
6. Tutorial-6 (Partial Differentiation)
7. Tutorial-7 (Applications of Partial Differentiation)
8. Tutorial-8 (Applications of Partial Differentiation)
9. Tutorial-9 (Partial Differential Equation)
10. Tutorial-10 (Partial Differential Equation)

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Define** Ordinary point, Singular point and Partial differentiation.
CO-2	**Explain** the difference between ordinary differential equation & partial differential equation.
CO-3	**Apply** different types of methods like Method of Variation of Parameters to solve Ordinary Differential Equation of higher order & slicing method to find volume of solids.
CO-4	**Classify** the types of Second Order Linear Partial Differential Equations
CO-5	**Evaluate** equation of tangent plane, normal line & extremum values of function**.**
CO-6	**Solve** the series solution of ordinary differential equation.

List of Open Source Software/learning website:

- https://nptel.ac.in
- www.sosmath.com

UPL University of Sustainable Technology

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: MH2112
Subject Name: Programming for Problem Solving

Semester: - I/II

Type of course: Engineering Science

Prerequisite: Zeal to learn the subject

Rationale: Understanding of basic principles of Engineering is required in various field of engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction to computer and programming:** Introduction, Basic block diagram and functions of various components of computer, Concepts of Hardware and software, Types of software, Compiler and interpreter, Concepts of Machine level, Assembly level and high level programming, Flowcharts and Algorithms	**5**
2	**Fundamentals of C:** Features of C language, structure of C Program, comments, header files, data types, constants and variables, operators, expressions, evaluation of expressions, type conversion, precedence and associativity, I/O functions	**4**
3	**Control structure in C:** Simple statements, Decision making statements, Looping statements, Nesting of control structures, break and continue, goto statement **Array & String:** Concepts of array, one and two dimensional arrays, declaration and initialization of arrays, string, string storage, Built-in-string functions	**10**
	SECTION-B	

Bachelor of Engineering
Subject Code: MH2112
Subject Name: Programming for Problem Solving

4	**Functions:** Concepts of user defined functions, prototypes, definition of function, parameters, parameter passing, calling a function, recursive function **Recursion:** Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series	**7**
5	**Pointers:** Basics of pointers, pointer to pointer, pointer and array, pointer to array, array to pointer, function returning pointer **Structure:** Basics of structure, structure members, accessing structure members, nested structures, array of structures, structure and functions, structures and pointers	**6**
6	**Dynamic memory allocation:** Introduction to Dynamic memory allocation, malloc(), calloc(), realloc(), free() **File management:** Introduction to file management, modes and its functions	**4**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**30**	**30**	**20**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Text Book:

1. Programming in ANCI C, Seventh edition, by Balagarusamy E, Tata McGraw-Hill Publishing Company Limited

Reference Books:

1. Programming with C, Second edition, by Gottfried, Tata McGraw-Hill Publishing Company Limited
2. C Programming language, Second edition, by Kernighan B W and Ritchie D M Prentice Hall
3. Let us C, Fifth edition, by Kanetkar Y. P., BPB Publication
4. Fundamentals of Computing and Programming in C, First Edition, by Pradip Dey, Manas Ghosh, Oxford University Press, 2009

Bachelor of Engineering
Subject Code: MH2112
Subject Name: Programming for Problem Solving

List of Practicals:

1. Write a program to compute Fahrenheit from centigrade (f=1.8*c +32)
2. Problems involving Branching Control structure
   a. Write a program to read marks of a student from keyboard whether the student is pass or fail(using if else)
   b. Write a program to read three numbers from keyboard and find out maximum out of these three. (nested if else)
   c. Write a program to read marks from keyboard and your program should display equivalent grade according to following table(if else ladder)

	Marks	Grade
a.	100 - 80	Distinction
b.	79 – 60	First Class
c.	59 – 40	Second Class
d.	< 40	Fail

   d. Write a C program to read no 1 to 7 and print relatively day Sunday to Saturday.
   e. Write a c program to find given no is prime or not.
3. Problems involving Looping Control structure
   a. Write a C program to input an integer number and check the last digit of number is even or odd.
   b. Write a C program to find the sum and average of different numbers which are accepted by user as many as user wants
   c. Write a program to calculate average and total of 5 students for 3 subjects (use nested for loops)
   d. Write a program to print following patterns

*	1	123	ABC	*
**	12	12	AB	* *
***	123	1	A	* * *

4. Problem Solving using Array
   a. Write a C program to read and store the roll no and marks of 20 students using array.
   b. Write a program to find out which number is even or odd from list of 10 numbers using array
5. Problem Solving using String
   a. Write a program to delete a character in given string.
   b. Write a program to reverse string.
6. Write a function Exchange to interchange the values of two variables, say x and y. illustrate the use of this function in a calling function.

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7. Write a program to find factorial of a number & Fibonacci series using recursion.
8. Define a structure type struct personal that would contain person name, date of joining and salary using this structure to read this information of 5 people and print the same on screen.
9. Write a C program to swap the two values using pointers.
10. Write a program to write a string in file.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Describe** fundamentals of computer & programming languages, to formulate algorithm/flowchart for given arithmetic and logical problem. Translate algorithm/flowchart into C program using correct syntax and execute it
CO-2	**Translate** algorithm/flowchart into C program to demonstrate the concept of variables, data types & operators. Decompose a problem into function.
CO-3	**Use** concept of branching & looping to design efficient C programs.
CO-4	**Analyze** C principles and apply the concept of user defined function & recursion to support reusability.
CO-5	**Develop** an application using the concepts of array, pointer, and structure to solve engineering and/or scientific problems.
CO-6	**Identify** various analytical skills required for solving complex engineering problems.

List of Open Source Software/learning website:

- Vlabs.iitb.ac.in
- NPTEL tutorials
- www.coursera.org

UPL University of Sustainable Technology

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: MH2113
Subject Name: Workshop Practices
Semester: - I/II

Type of course: Engineering Science

Prerequisite: Zeal to learn the subject

Rationale: Workshop practice is the backbone of the real industrial environment which helps to develop and enhance relevant technical hand skills required by the technician working in the various engineering industries and workshops. Irrespective of branch, the use of workshop practices in day to day industrial as well domestic life helps to dissolve the problems.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
0	0	4	2	0	0	80	20	100

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction of Workshop:** Introduction, Workshop layout, Importance of various sections/shops of workshop, Type of jobs done in each shop, General safety rules and work procedure of work shop.	**4**
2	**Carpentry Shop:** Exercise & Demonstration of various tools, basic measuring instruments, materials, Marking and Measurement in shop.	**10**
3	**Fitting Shop:** Exercise & Demonstration of various tools, basic measuring instruments, materials, Marking and Measurement in shop.	**10**
	SECTION-B	
4	**Tin Smithy Shop:** Exercise & Demonstration of various tools, basic measuring instruments, materials, Marking and measurement in shop.	**6**
5	**Welding and Smithy Shop:** Demonstration of various tools, basic measuring instruments, materials,	**8**

Bachelor of Engineering
Subject Code: MH2113
Subject Name: Workshop Practices

	Marking and Measurement in Shop.	
6	**Machine Shop:** Demonstration of various tools, basic measuring instruments, materials, Marking and Measurement in Machine Shop.	**6**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
NA	**NA**	**NA**	**NA**	**NA**	**NA**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Text Books:

1. Basic Workshop Practice Manual - T Jeyapoovan; Vikas Publishing House (P) Ltd.,New Delhi
2. Mechanical workshop practice.- K.C. John by PHI publications

Reference Books:

1. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House, 2017.
2. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
3. Workshop Technology Vol. 1 and 2 by Raghuvanshi B.S. Dhanpat Rai & Sons, 1998.
4. Workshop Technology by Chapman W.A. J and Arnold E. Viva low priced student edition, 1998.
5. Workshop Practices, H S Bawa, Tata McGraw-Hill, 2009.

List of Practical:

1. Introduction to Mechanical Workshop.
2. Prepare job in Carpentry Shop.
3. Prepare job in Fitting Shop
4. Prepare job in Tin Smithy Shop

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Subject Name: Workshop Practices

5. Demonstration of job in Welding Shop.
6. Demonstration of job in Smithy Shop.
7. Demonstration of job in Machine Shop (Lathe Machine).
8. Demonstration of job in Machine Shop (Drilling Machine).
9. Demonstration of job in Machine Shop (Shaping Machine).
10. Demonstration of job in Machine Shop (Milling Machine).

Course Outcomes:

Sr. No.	CO statement
CO-1	**Identify** various tools.
CO-2	**Describe** applications of hand tools and power tools.
CO-3	**Select** and **operate** the appropriate tools required for specific operation.
CO-4	**Identify** and **Analyze** errors in measurements of dimensions of Job.
CO-5	**Prepare** various jobs as per **sequence** of operation and **assemble** it.
CO-6	**Explain** the safety **measures** required to be taken while using the tools.

List of Open Source Software/learning website:

- http://nptel.iitm.ac.in/courses.php

UPL University of Sustainable Technology

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: MH2107
Subject Name: English

Semester-I/II

Type of course: Language and Communication

Prerequisite: Zeal to learn the subject

Rationale: The rationale of the curriculum is to help students refresh their knowledge of English language. It also targets the understanding of grammar, focusing on comprehension, and reading, speaking and writing skills. This would be developed through balanced and integrated tasks.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	0	2	3	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Vocabulary building:** Introduction to Word Formation, Types of word formation processes: compounding, clipping, blending, derivation, creative respelling, coining and borrowing, Acquaintance with prefixes and suffixes Synonyms, antonyms, and standard abbreviations.	5
2	**Phonetics:** IPA Transcription Introduction to different accents	4
3	**Identifying Common Errors:** Writing: Tenses , Subject-verb agreement , Noun-pronoun agreement , Misplaced modifiers, Articles Prepositions Modal Auxiliaries Redundancies	3
	SECTION-B	
4	**Basic Writing Skills:** Sentence Structures , Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence , Organizing principles of paragraphs in documents	4
5	**Nature and Style of Writing**: Describing , Defining , Classifying Writing introduction and conclusion	4
6	**Writing Practices:** Comprehension, Précis Writing, Letter Writing, Email etiquettes, Abstract , Memo writing	4

Bachelor of Engineering
Subject Code: MH2107
Subject Name: English

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**10**	**20**	**20**	**20**	**20**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Text Book:

1) Bhavika Vyas & Dhara Tejura, English, Mahajan Publishing House, Ahmedabad

Reference Books:

1) Technical English, Dr. M. Hemamalini, Wiley. 2014
2) Practical English Usage, Michael Swan, OUP. 1995
3) Remedial English Grammar, F.T. Wood, Macmillan. 2007
4) Oxford Language Reference, (Indian Edition) OUP
5) On Writing Well, William Zinsser, Harper Resource Book. 2001
6) Study Writing, Liz Hamp-Lyons and Ben Heasly, Cambridge University Press. 2006
7) Communication Skills, Sanjay Kumar and Pushp Lata, Oxford University Press. 2011
8) Exercises in Spoken English, Parts. I-III. CIEFL, Hyderabad. Oxford University Press
9) The Study of Language, George Yule, CUP, 4th Edition. 2010
10) A Course in English Phonetics, T R Kansakar, Orient Longman. 1998
11) Spoken English, R K Bansal and J B Harrison, Orient Longman. 2013

List of Practical/ tutorials:

1) Word Formation-1
2) Word Formation-2
3) Listening Comprehension
4) Transcription and dictionary usage
5) Common Everyday Situations: Conversations and Dialogues
6) Communication at Workplace
7) Common errors in writing
8) Reading Comprehension

Bachelor of Engineering
Subject Code: MH2107
Subject Name: English

9) Letter Writing, Precis Writing
10) Email Writing: Formal and Informal

Course Outcomes: At the end of the course students will be able to-

Sr. No.	CO statement
CO-1	Present ideas using various forms of vocabulary in varied situations in oral and written communication.
CO-2	Identify the phonetic symbols and the transcription pattern to learn correct pronunciation.
CO-3	Apply the dynamics of various rules of grammar and check its validation while they speak and write language correctly.
CO-4	Analyze grammar effectively to make themselves competent Listener, Speaker, Reader and Writer by exposing to various set of situations.
CO-5	Relate to various formal and informal documents of day to day life and professional set up.
CO-6	Revise the qualities of writing in diverse situation by using the nuances such as conciseness, clarity, accuracy, organization, and coherence.

List of Open Source Software/learning website:

i. http://www.english-online.org.uk/
ii. http://www.learnenglish.de/

UPL University of Sustainable Technology

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: MH2105
Subject Name: India Constitution

Semester: - I/II

Type of course: Humanities & Social Sciences

Prerequisite: Social Awareness

Rationale: The rationale of the curriculum is to refresh the national and constitutional awareness of students

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
1	0	0	1	50	0	0	0	50

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Meaning of the constitution law and constitutionalism** Salient features and characteristics of the Constitution of India	2
2	**Fundamental rights &Duties** , Right to Equality under Article – 14 , Right to certain Freedom under Article 19 , Scope of the Right to Life and Personal Liberty under Article 21,Fundamental Duties and its legal status	3
3	**Federal structure and distribution of legislative and financial powers** between the Union and the States	3
	SECTION-B	
4	**Parliamentary Form of Government in India** – The constitution powers and status of the President of India	2
5	**Powers and Procedure for Amendments** in Indian Constitution	2
6	**Emergency Provisions** : National Emergency, President Rule, Financial Emergency , Local Self Government – Constitutional Scheme in India	2

Bachelor of Engineering
Subject Code: MH2105
Subject Name: India Constitution

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**10**	**20**	**20**	**20**	**20**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Text Book:

1. V.S Bagad, Indian Constitution, Technical Publications

Reference Books:

1. Constitutional Law of India, Dr. J.N. Pandey, Central Law Agency
2. Introduction to the Constitution of India, Durga Das Basu, LexisNexis.
3. Indian Constitutional Law, M.P. Jain, LexisNexis
4. V.N.Shukla's Constitution of India, Mahendra Pal Singh, Eastern Book Company
5. Constitutional Law – I Structure, Udai Raj Rai, Eastern Book Company

Course Outcomes:

After completion of this course students will able to

Sr. No.	CO statement
CO-1	**Present** human values , create awareness about law enactment and importance of Constitution
CO-2	**Associate** the Fundamental Rights and Fundamental Duties of the Indian Citizen to instill morality, social values, honesty, dignity of life and their social Responsibilities
CO-3	**Examine** awareness of their surroundings, society, Social problems and their suitable solutions while keeping rights and duties of the citizen in mind.
CO-4	**Analyze** distribution of powers and functions of Local Self Government.
CO-5	**Explain** the National Emergency, Financial Emergency and their impact on Economy of the country.
CO-6	**Interpret** constitutionalism for social welfare

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Bachelor of Engineering
Subject Code: MH2108
Subject Name: Environmental Studies & Sustainability

Semester: - I/II

Type of course: Engineering Science

Prerequisite: Enthusiasm about conservation of natural resources, pollution control and sustainable development for sustaining the life on the mother earth.

Rationale: The principal motive of this subject is to make students aware about environment, environmental pollution and related aspects.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
1	0	0	1	50	0	0	0	50

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	Definition, Scope & Importance, Need of public awareness, Environment and its Components, Atmosphere, Altitude Vs temperature profile, Ecosystem, Biodiversity conservation.	**2**
2	Resources-Renewable and Non-renewable, Natural Resources Availability and Quality aspects of Air & Water.	**1**
3	Energy-Different types of Energy and levels, Biomass and Biogas, Alternative source of Energy- Hydrogen, Solar, Wind	**2**
	SECTION-B	
4	Environmental pollution: causes, effects and control, Marine water pollution, Industrial & Municipal waste: Municipal waste, Radioactive, Plastic Waste & e-waste, Disposal of waste, 5R's technique, Role of individual in pollution prevention. Pollution case studies	**3**

5	Current Environmental Issues and Importance, Environmental Treaties, Protocols & Agreements - National & International level	**2**
6	Basics of Environmental Audit, Sustainable Development, Recent technologies for sustainable development, ZLD approach, Introduction to Environmental Impact assessment & important Legislations.	**2**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30	**30**	**20**	**20**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Text Books:

1. Text book of Environmental Science & Technology- m. Anji Reddy- BS Publication.
2. Basics of Environmental Studies by U K Khare, 2011 Published by Tata McGraw Hill.

Reference Books:

1. Environmental Studies by Benny Joseph, TMH publishers.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.
3. Environmental Studies- R. Rajagopalan-Oxford Publication.

Bachelor of Engineering
Subject Code: MH2108
Subject Name: Environmental Studies & Sustainability

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Define** the principles and scope of Environmental Science
CO-2	**Identify** the types of pollution in society along with their sources and effects
CO-3	**Demonstrate** the generation and management of various types of wastes and its control
CO-4	**Relate** the national & international environmental issues and treaties.
CO-5	**Explain** the concept Sustainable development and Environment management
CO-6	**Appraise** the role of government and non-government organization in pollution control

List of Open Source Software/learning website:

- NPTEL tutorials
- www.coursera.org

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2101
Subject Name: Programming in C++

Semester: - II

Type of course: Engineering core

Prerequisite: Basic knowledge of Computer

Rationale: C++ is an entry-level programming language, and, in many ways, the foundation of advanced programming languages like Java and Python. Therefore, it is in great demand in India and offers excellent career opportunities to the students who work in the IT sector.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Principles of Object Oriented Programming** Basic Concepts of Object Oriented Programming, Benefits of OOP, Application of OOP, C++ Program Structure, Application of C++, Creating the source file, compile & linking.	5
2	**C++ Basics** namespace, identifiers, variables, constants, data types, enum, operators, typecasting, control structure. **C++ Functions** Simple function, Call and Return by reference, Inline functions, Macro Vs. Inline functions, Overloading of functions, default arguments, friend functions, virtual functions.	7

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Subject Code: CO2101
Subject Name: Programming in C++

3	**Objects and Classes** Basics of object and class in C++, Private and public members, static data and function members, friendly function, constructors and their types, destructors, operator overloading, type conversion. **Manipulating String** Creating String Object, manipulating String Objects, Relational operations, String Characteristics, Accessing Characters in Strings, comparing and swapping	**7**
SECTION-B		
4	**Inheritance** Concept of Inheritance, types of inheritance: single, multiple, multilevel, hierarchical, hybrid, protected members, virtual base class, Abstract class, constructor in derived class, member classes. **Polymorphism** Pointers in C++, Pointes and Objects, this pointer, virtual and pure virtual functions, Implementing polymorphism	**8**
5	**I/O and File Management** C++ stream classes, Unformatted and formatted I/O, manipulators, Introduction of File stream, C++ File stream classes, File management functions, File modes, Binary and random Files	**5**
6	**Templates, Exceptions and STL** What is template? function templates and class templates, Introduction to exception, Exception handling mechanism, Throwing, Catching and Rethrowing exception, implementing user defined exceptions, Overview and use of Standard Template Library	**7**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**30**	**25**	**15**	**5**	**5**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Bachelor of Engineering
Subject Code: CO2101
Subject Name: Programming in C++

Text Book:

1. Object Oriented Programming With C++ by E Balagurusamy, TMH

Reference Books:

1. C++ Programming, Black Book by Steven Holzner, dreamtech.
2. Object Oriented Programming in Turbo C++ by Robert Lafore, Galgotia.
3. Object Oriented Programming with ANSI and Turbo C++ by Ashok Kamthane, Pearson.
4. The Compete Reference C++ by Herbert Schlitz, TMH.

List of Practical:

1. Write a function using reference variables as arguments to swap the values of a pair of integers.
2. Declare a class called book details to represent details for a book, having data members like title, author, edition, price and no of copies available. Define following functions:
    a. constructor(s)
    b. display() - to display all data members
    c. find_books() - to find and display details of all books having price less than Rs. 250
    d. main() - to create an array of book details and to show usage of above functions.
3. Create two classes DM and DB which store value of distance. DM stores distance in meters and centimeters and DB in feet and inches. Write a program that can read values for the class objects and add one object of DM with another object of DB. Use the friend function to carry out the addition operation. The object that stores the results may be a DM object or DB object, depending on the units in which results are required. The display should be in the format of meters and centimeters or feet and inches depending on the object on display.
4. Define Class named point which represents 2-D Point, i.e P(x; y). Define Default constructor to initialize both data member value 5, Parameterized constructor to initialize member according to value supplied by user and Copy Constructor. Define Necessary Function and Write a program to test class Point.

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Subject Code: CO2101
Subject Name: Programming in C++

5. Declare a class called bird having private data members name and weight. Define following functions :
   - default constructor for reading data members from key board
   - overloaded constructor with two arguments to be used for initialization of data members.
   - display function to display data members.
   - overloaded member operator >= to compare weight of two bird objects, returning false if weight of first bird object is less than that of the second & true otherwise.
6. Create a class COORD having variables x & y. Using operator overloading make friend functions allowing following statements in the main function,
   (a) obj3 = obj1 + obj2;
   (b) obj2 = obj1 + 10;
   (c) obj2 = 10 + obj1;
7. Write any program to depict importance of virtual function and pure virtual function.
8. Using command line arguments, write a program that reads a file and reverses the case of all characters of that file and writes it in another file.
9. Write a program to demonstrate rethrow, multiple catch and catch all.
10. Write a program to demonstrate use of template.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Describe** the important concepts of object oriented programming like object and class, Encapsulation, inheritance and polymorphism.
CO-2	**Write** the simple C++ programs using the variables, operators, control structures, functions and I/O objects cin and cout.
CO-3	**Understand** concepts of Objects, Class and String.
CO-4	**Use** features of C++ like inheritance and polymorphism.
CO-5	**Develop** programs using OOPS concept, I/O streams and files to solve real life problems.
CO-6	**Create** application using advance features like temples and exception to make programs supporting reusability and sophistication**.**