Revised Syllabus for First Year of B. Tech. and M.Sc. (Integrated) Programmes

(Implemented from Academic Year 2019-20)

(Approved by 43rd Senate dated 04-05-2019)

SARDAR VALLABHBHAI NATIONAL INSTITUTE OF TECHNOLOGY, SURAT

Academic Year : 2018-19

Teaching Scheme of B. Tech.-I (Semester I & II)
DIVISION – A, B, C, D, E & F

SEMESTER – I

Sr. No.	Subject	Code	Scheme	Credit
1	**Mathematics-I**	**MA 101 S1**	**3-1-0**	**04**
2	**Branch Specific Course-I**	**XXXX 102 S1**	**3-1-0/3-0-2**	**04**
3	Mechanics, Lasers and Fiber Optics	PH 103 S1/S2	3-0-2	04
4	Applied Chemistry	CY 104 S1/S2	3-0-2	04
5	Engineering Drawing	CEME 105 S1/S2	2-0-4	04
6	Energy and Environmental Engineering	CEME 106 S1/S2	3-0-2	04
7	Holistic Empowerment and Human Values*	HU 107 S1/S2	3-0-0	00
		Total	20-2-10=32/ 20-1-12=33	24

* Audit Course (attendance would be compulsory as per institute norms)

SEMESTER – II

Sr. No.	Subject	Code	Scheme	Credit
1	Engineering Mechanics	AM 108 S2/S1	3-0-2	04
2	Fundamentals of Computer & Programming	CS 109 S2/S1	3-0-2	04
3	English & Professional Communication	HU 110 S2/S1	3-0-0	03
4	Workshop Practice	ME 111 S2/S1	0-0-4	02
5	Physics of Materials and Nuclei	PH 112 S2/S1	4-0-0	04
6	**Branch Specific Course-II**	**XXXX 113 S2**	**3-1-0/3-0-2**	**04**
7	**Mathematics-II**	**MA 114 S2**	**3-1-0**	**04**
		Total	19-2-8=29/ 19-1-10=30	25

S1 = Semester-1, S2 = Semester-2
AM = Applied Mechanics, CH = Chemical, CE = Civil, CS = Computer,
ME = Mechanical, EE = Electrical, EC = Electronics,
PH = Physics, CY = Chemistry, MA = Mathematics, HU = Humanities

Branch Specific Course: First two letters indicate branch for which the course is offered and the last two letters indicate the department which is offering the course

Teaching Scheme of B. Tech.-I (Semester I & II)
DIVISION – G, H, I, J, K & L

SEMESTER – I

Sr. No.	Subject	Code	Scheme	Credit
1	**Mathematics-I**	**MA 101 S1**	**3-1-0**	**04**
2	**Branch Specific Course-I**	**XXXX 102 S1**	**3-1-0/3-0-2**	**04**
3	Engineering Mechanics	AM 108 S1/S2	3-0-2	04
4	Fundamentals of Computer & Programming	CS 109 S1/S2	3-0-2	04
5	English & Professional Communication	HU 110 S1/S2	3-0-0	03
6	Workshop Practice	ME 111 S1/S2	0-0-4	02
7	Physics of Materials and Nuclei	PH 112 S1/S2	4-0-0	04
		Total	19-2-8=29/ 19-1-10=30	25

SEMESTER – II

Sr. No.	Subject	Code	Scheme	Credit
1	Mechanics, Lasers and Fiber Optics	PH 103 S2/S1	3-0-2	04
2	Applied Chemistry	CY 104 S2/S1	3-0-2	04
3	Engineering Drawing	CEME 105 S2/S1	2-0-4	04
4	Energy and Environmental Engineering	CEME 106 S2/S1	3-0-2	04
5	Holistic Empowerment and Human Values*	HU 107 S2/S1	3-0-0	00
6	**Branch Specific Course-II**	**XXXX 113 S2**	**3-1-0/3-0-2**	**04**
7	**Mathematics-II**	**MA 114 S2**	**3-1-0**	**04**
		Total	20-2-10=32/ 20-1-12=33	24

* Audit Course (attendance would be compulsory as per institute norms)

S1 = Semester-1, S2 = Semester-2
AM = Applied Mechanics, CH = Chemical, CE = Civil, CS = Computer,
ME = Mechanical, EE = Electrical, EC = Electronics,
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Mathematics-I		**L**	**T**	**P**	**Credit**
MA 101 S1	**Scheme**	**3**	**1**	**0**	**04**

- **DIFFERENTIAL CALCULUS** (**10 Hours**)
  Differentiation of Hyperbolic and Inverse Hyperbolic functions. Successive Differentiation, standard forms, Leibnitz's theorem and applications, Power series, Expansion of functions, Taylor's and Maclaurin's series. Curvature, Radius of curvature for Cartesian curve with application.

- **PARTIAL DIFFERENTIATION** (**10 Hours**)
  Partial differentiation, Euler's theorem for homogeneous function, Modified Euler's theorem, Taylor's and Maclaurin's series for two variables. Tangent plane and Normal line, Error and Approximation, Jacobians with properties, Extreme values of function of two variables, Lagrange's methods of undetermined multipliers

- **CURVE TRACING** (**05 Hours**)
  Cartesian, polar and parametric form of standard curves.

- **BETA AND GAMMA FUNCTION** (**04 Hours**)
  Beta and Gamma function with their properties and duplications formula without proof.

- **DOUBEL INTEGRALS** (**08 Hours**)
  Reorientation of concepts of integrals and Double integrals, evaluation techniques, change of order of Integration, change of variable, Application of double integrals for evaluation of area and volume.

- **TRIPLE INTEGRALS** (**05 Hours**)
  Triple integrals, evaluation techniques, Application of triple integrals for evaluation of volume.

(Total Lecture Hours: 42)

Books Recommended:
1. James Steward De Calculas, Thomson Asia, Singapore, 2003.
2. O'Neil Peter., "Advanced Engg. Mathematics", Thompson, Singapore, Ind. Ed. 2002.
3. Kreyszing E., "Advanced Engineering Mathematics", John Wiley & Sons, Singapore, Int. Student Ed. 2015.
4. Wiley C. R., "Advanced Engineering Mathematics", McGraw Hill Inc., New York Ed. 1993.
5. F. B. Hilderband, "Methods of Applied mathematics", PHI, New Delhi, 1968

Reference Books:
1. Ramana D. V., "Higher Engg. Mathematics", The MaGraw-Hill Inc., New Delhi, 2007.
2. Srimanta Pal, Subodh C. Bhunia, " Engineering Mathematics", Oxford University Press, New Delhi, 2015.
3. Bali and Iyengar. Engg. Mathematics, Laxmi Publications, New Delhi, 2004.

Mechanics, Lasers and Fiber Optics		L	T	P	Credit
PH 103 S1 **PH 103 S2**	**Scheme**	3	0	2	04

- **CLASSICAL MECHANICS** **(10 hours)**
  Constraints, Generalised Coordinates, Velocities and momenta, D'Alembert's Principle, Lagrange's equation of motion, Planet orbits, Virial theorem, Calculus of variations, Variational technique for many independent variables, Hamilton principle, Hamilton's canonical equation of motion, Physical significance of H, Advantage of Hamilton approach.

- **QUANTUM MECHANICS** **(10 hours)**
  Inadequacy of classical mechanics (black body radiation, photoelectric effect), Wave and particle duality of radiation, de Broglie concept of matter waves, Electron diffraction, Heisenberg's uncertainty principle, Schrodinger's wave equation, Eigenvalues and eigenfunctions, Superposition principle, Interpretation of wave function, Particle confined in one dimensional infinite potential box.

- **ELECTRODYNAMICS** **(06 hours)**
  Electromagnetic waves, Maxwell's equations in vacuum & medium, Types of polarization, Internal field and Claussius-Mosotti equation.

- **LASERS** **(08 hours)**
  Introduction to Laser, Characteristics of Lasers, Spontaneous and stimulated emissions, Einstein's coefficients, Population inversion and lasing action, Laser systems: Ruby laser, He-Ne Laser, Semiconductor Laser, Advanced lasers, Holography.

- **FIBER OPTICS** **(08 hours)**
  Fermat's principle and Snell's law-optical fiber, Principle and construction, Acceptance cone, Numerical aperture, V-Number, Types of fibers, Fabrication: Double Crucible Technique, Vapour phase Oxidation Process, Fiber optic communication principle, Fiber optic sensors, Other applications of optical fibers.

(Total Lecture Hours: 42)

BOOKS RECOMMENDED:

Text Books:
1. R. Resnick and D. Halliday Physics (Part I & II) Wiley 2007
2. A. Beiser Concept of the Modern Physics McGraw-Hill 2008
3. Landau and Lipschitz Mechanics Butterworth-Heinemann 1982

Reference Books:
1. D. J. Griffiths Introduction to Electrodynamics Addison-Wesley 2012
2. W. T. Silfvast Laser Fundamentals Cambridge 2004

Applied Chemistry		L	T	P	Credit
CY 104 S1 **CY 104 S2**	**Scheme**	**3**	**0**	**2**	**04**

- **WATER** **(08 Hours)**
  Structure of water, physical and chemical properties, Hydrogen bonding, Specifications for water in industries, types of water (raw water, cooling water, boiler water, nuclear water), Hardness of water, Estimation and units of Hardness, Boiler feed water, Boiler Problems - Scales & Sludge, Priming, Foaming, Carryover, Caustic Embrittlement, Boiler corrosion, Desalination. Water softening (lime-soda, zeolite and ion-exchange) methods.

- **POLYMER** **(06 Hours)**
  Introduction of Polymers: Classification of polymers, nomenclature, functionality in polymers, number and weight average molecular weight, molecular weight distribution (PDI), Chain Architecture (Linear/Branched, Tacticity, Isomerism), homopolymers, copolymers, graft copolymers and their characteristic properties in reference to their applications. Types of polymerization: addition, condensation, chain growth and step growth. Polymerization techniques: bulk, suspension and emulsion polymerization. Moulding constituents of Polymer, Moulding (Injection, Extrusion and Compressing) methods.

- **CHEMISTRY OF MATERIALS** **(08 Hours)**
  Alloys: Introduction, Necessity of making alloys, classification, Metal-Metal alloy: Brass (properties and applications), Metal-Non-metal alloy: Steel (properties), Composites: Introduction, classification, particulate composites, structural composites (Laminar and Sandwich), Advantages and applications of Composites, Nanomaterials – properties synthesis (sol-gel) and applications, Basics of Green Chemistry.

- **INSTRUMENTAL TECHNIQUES** **(06 Hours)**
  Theoretical and Experimental: Conductometry, Colorimetry, Potentiometry, pH-metry.

- **DYES AND DRUGS** **(09 Hours)**
  Introduction to Dyes: Sources and classification of dyes (chemical composition and applications), Requirements for a true dye, Witt's theory, Mode of application, Mechanisms of dyeing; Thermodynamics of dyeing; Kinetics of dyeing; Dye-fibre interactions; Role of fibre structure in dyeing.
  Introduction to Drugs: Sources and classification of drugs, requirement for an ideal drug, routes of administration, pharmaceutical phase, pharmacokinetic phase, bioavailability of a drug and pharmacodynamics phase, Examples of Drug Action: Concept of antibiotics, Structure and activity of Penicillin, Properties and synthesis of Vitamin-C.

- **CORROSION AND ITS CONTROL** **(05 Hours)**
  Introduction, types and mechanism of (Chemical and Electrochemical) corrosion, Types of Electrochemical corrosion (Galvanic, Pitting, Crevice), Passivity, Galvanic series, Factors influencing corrosion, Protective measures against corrosion: (i) Modification of the environment (ii) Modification of the properties of the Metal (iii) Prevention of corrosion by Materials selection and Design (iv) Other corrosion prevention methods.

(Total Lecture Hours: 42)

PRACTICALS:

1. Potentiometric redox titration of Fe^{2+} against standard Ce^{4+} solution.
2. pH-metric titration of acidic water against standard base.
3. Iodometric determination of Cu in Brass sample.
4. Complexometric determination of hardness of water.
5. Trimetric determination of l - Ascorbic acid (Vitamin-C).
6. Estimation of COD in waste water.
7. Determination of DO in waste water.
8. Conductometric titration to determine the strength of strong acid by strong base.
9. Electrode deposition study of Cu.
10. Concentration determination of Co as a Pollutant using Spectrophotometer.

BOOK RECOMMENDED:-

1. Jain P.C. and Jain M. 'Engg. Chemistry' Dhanpat Rai Publishing Co. New Delhi, 15th Edition 2006.
2. Chawla S., 'A Textbook of Engineering Chemistry', Dhanpat Rai & Co., Latest Edition, 2015.
3. Tripathy S.K., Pandhy A.K. and Panda A.K. 'Material Science & Engineering', Scitech Publications (India) Pvt. Ltd., 2nd Edition, 2009.
4. Vogel A. I. and Mendham J., 'Vogel's Textbook of Quantitative Chemical Analysis Hall, 6th Edition, 2002.
5. Sharma B. K. 'Engg. Chemistry', Krishana Prakashan Media (P) Ltd, 2008.

Engineering Drawing		L	T	P	Credit
CEME 105 S1 **CEME 105 S2**	**Scheme**	**2**	**0**	**4**	**04**

- **INTRODUCTION** **(01 Hours)**
  Importance of Engineering Drawing, Drawing instruments and materials, B.I.S. and ISOConventions, First angle and third angle projection method.

- **ENGINEERING CURVES** **(03 Hours)**
  Classification of engineering curves, construction of conics, cycloidal curves, Involutes and spirals.

- **PROJECTION OF POINTS, LINES AND PLANES** **(04 Hours)**
  Introduction to principal planes of projection, Projections of the points located in same and different quadrant, projection of lines with its inclination to the reference planes, true length of the lines and its inclination with reference planes, projection of planes with its inclination with two reference planes, concept of auxiliary plane method for projection of planes.

- **PROJECTION AND SECTION OF SOLIDS** **(03 Hours)**
  Classification of the solids, projections of the solids like cylinder, cone, pyramid and prism with its inclination to two reference planes, Section of such solids and true shape of the section

- **PENETRATION CURVE** **(03 Hours)**
  Classification, line of interaction, line/generator method and section plane method;intersection of two prisms, two cylinders, interaction of cone and cylinder, pyramid with prism.

- **DEVELOPMENT OF THE LATERAL SURFACES** **(02 Hours)**
  Method of development, parallel line development, radial line development, developments of cylinder, cone, prism, pyramid, true length of edges – oblique surface.

- **ORTHOGRAPHIC PROJECTIONS** **(04 Hours)**
  Projections from pictorial view of the object on the principle planes for view from front, top and side using first and third angle of projection method

- **ISOMETRIC PROJECTIONS** **(04 Hours)**
  Terminology, isometric scale, isometric view and isometric projection, isometric axes and lines

- **INTRODUCTION TO COMPUTER AIDED DRAFTING** **(04 Hours)**
  Introduction of the drafting and modeling tools and demonstration of its application in latest machines.

(Total Lecture Hours: 42)

PRACTICALS: Practice with drawing sheets
1. Orthographic views
2. Isometric views
3. Engineering curves.
4. Projection of points and planes
5. Projection of solids.
6. Section of solids
7. Penetration curve and surface development
8. Demonstration of computer aided drafting and demonstration of its application in latest machines.

BOOKS RECOMMENDED:
1. Bhatt N. D., Engineering drawing, Charotar publishing house, 2014
2. Shah P. J., Engineering Graphics, S. Chand and Company, 2013

Energy and Environmental Engineering		L	T	P	Credit
CEME 106 S1 **CEME 106 S2**	**Scheme**	**3**	**0**	**2**	**04**

- **ENVIRONMENT AND ECOSYSTEMS** (12 hours)
  Introduction: Concept of an ecosystem- structure and functions of ecosystem. Components of ecosystem - producers, consumers, decomposers, Food chains, food webs, ecological pyramids, Energy flow in ecosystem. Bio-geo- chemical cycles, Hydrologic cycle
  Components of Environment and their relationship, Impact of technology on environment, Environmental degradation. Environmental planning of urban network services such as water supply, sewerage, solid waste management.

- **ENVIRONMENTAL POLLUTION** (10 hours)
  Water, air, soil, noise, thermal and radioactive, marine pollution: sources, effects and engineering control strategies. Drinking water quality and standards, Ambient air and noise quality standards

- **GLOBAL ENVIRONMENTAL ISSUES AND ITS MANAGEMENT** (8 hours)
  Engineering aspects of climate change. Acid rain, depletion of ozone layer. Concept of carbon credit. Concepts of Environmental impact assessment and Environmental audit. Environmental life cycle assessment

- **ENERGY FUNDAMENTALS** (8 hours)
  Energy systems. Importance of energy. Quantifying energy, types of energy sources and end uses. Energy conversion processes. Conventional energy sources. Non-conventional energy sources.

- **ENERGY AND THE ENVIRONMENT** (7 hours)
  Global and Indian energy demand and growth. Environmental impacts of energy production – air and water. Climate change and energy. Energy and environment policy. Transportation and energy. Built environment and energy

  (Total Lecture Hours: 42)

REFERENCES
1. Daniel B Botkin& Edward AKeller,Environmental Sciences, John Wiley & Sons
2. R. Rajagopalan, Environmental Studies, Oxford UniversityPress
3. Benny Joseph,Environmental Studies, TMHpublishers
4. Dr. Suresh K Dhameja,Environmental Studies, S K Kataria& Sons, 2007
5. U K Khare,Basics of Environmental Studies, Tata McGrawHill, 2011

Practical
1. Study of different ecosystem and different Biochemical cycles.
2. Study of Water Treatment Plant.
3. Study of Water Distribution Network.
4. Study of Effluent Treatment Plant
5. Study of Solid Waste Management system for urban area.
6. Demonstration of air pollution and noise monitoring equipments
7. Exercise on life cycle Assessment
8. Exercise on EIA
9. Exercise on Quantifying energy and energy growth demand
10. Analysis of Carbon Credit
11. Tutorial on Energy in Built environment

	L	**T**	**P**	**Credit**
Holistic Empowerment and Human Values				
HU 107 S1 **HU 107 S2** — **Scheme**	**3**	**0**	**0**	**00**

- **INTRODUCTION** (06 hours)
  Motivation behind the course, Holistic Empowerment, Mental, Spiritual and Social Health

- **HUMAN VALUES AND ETHICS** (12 hours)
  Positive Attitude and Professional Ethics, Values through Literature, Sustainable Leadership for Professional and Personal Effectiveness, Social Media Pros and Cons.

- **HEALTH AND MEDICATION** (12 hours)
  Awareness about life style diseases, Emotional Intelligence, Substance Abuse, Life Management Skills

- **PHYSICAL FITNESS AND MENTAL HEALTH** (12 hours)
  Importance of games and exercises on Physical Fitness, Importance of Yoga and Meditation on Physical and Mental Health

(Total Lecture Hours:42)

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Books Recommended:
1. Chakraborty, S. K. and Chakraborty, Debanshu, Human Values and Ethics: Achieving Holistic Excellence, The ICFAI University Press, Hyderabad, (2006).
2. Gaur, R.R., Sangal, R. and Bagaria, G.P., A Foundation Course in Human Values and Professional Ethics
3. R. Subramanian, Professional Ethics, Oxford University Press, (2013).
4. Kalam, A P J Abdul, Ignited Minds: Unleashing the Power Within India, Penguin; Latest edition (12 November 2014), ISBN-13: 978-0143424123
5. Kalam, A P J Abdul, Wings of Fire: An Autobiography, Universities Press; 1st edition (1999), ISBN-10: 8173711461
6. Priestley, J. B., An Inspector Calls, Three Acts Play
7. http://livingvalues.net/ Living Values Education Activities for Young Adults, Book 1: 2019
8. Living Values Education Activities for Young Adults, Book 2: 2019

Engineering Mechanics

AM 108 S1
AM 108 S2

	L	T	P	Credit
Scheme	**3**	**0**	**2**	**04**

- **INTRODUCTION TO FORCES/EQUILIBRIUM OF RIGID BODY**   **(08 Hours)**
    - Scalar and vector, system of forces, resultant force
    - Statics of particle. Free-body diagram. Equilibrium of particle in two dimensions.
    - Resultant of three or more concurrent forces, Resolution of a force into components. Rectangular components of a force. Resultant by rectangular components.
    - Concurrent force system in space: Resolution of a force into rectangular components in space.
    - Coplanar Non-Concurrent Force Systems, Moments about Point and Axis. Equilibrium of Non-coplanar Non-concurrent Forces

- **CENTROID AND MOMENT OF INERTIA**   **(08 Hours)**
    - Distributed forces: Centroid and centre of gravity. Determination of centroid of lines and areas using integral technique.
    - Determination of centroid of composite wires and areas.
    - Centroid of volumes. Theorems of Pappus - Guldinus and its applications.
    - Second moment of areas. Definition of moment of inertia. Determination of moment of area by integration.
    - Parallel axis theorem for Moment of Inertia. MI of composite area. Concept of Mass moment of inertia of body.

- **TRUSS**   **(06 Hours)**
    - Types of structure in Engineering. Trusses and beams: definition, stability and determinacy.
    - Determination of reactions at supports for planar trusses. Basic assumption for analysis of trusses. Procedures for analysis of trusses.
    - Analysis of plane trusses by method of joint. Concept of zero force member. Analysis of plane trusses by method of section.

- **BEAMS AND CABLES**   **(06 Hours)**
    - *Beams*
    Definitions, types of beam, types of loading, types of support. Determination of reactions for simply supported, overhanging beams and compound beam.
    - *Cables*
    Cables with Concentrated Loads

- **FRICTION**   **(05 Hours)**
    - The Law of Dry Friction. Coefficient of Friction, Angle of Friction.
    - Analysis of systems involving dry frictions such as ladder spheres etc.
    - Belt Friction, Analysis of flat belt, wedge friction.

- **KINETICS OF PARTICLES**   **(08 Hours)**
    - Force and acceleration. Newton's laws of motion. D'Alembert's principle.
    - Dependent motion of particles. Analysis for dependent motion of particles.
    - Impulse and Momentum: Concept, Definition, Principle of linear momentum and impulse
    - Work Energy Principle.

- **VIBRATIONS** (03 Hours)
  - o Definitions, Equation of motion for single degree of freedom.
  - o Introduction to free and forced vibrations.
  - o Procedure for analysis of system involving free and forced vibrations.
  - o Example on free vibration.
  - o Example on forced vibration.

(Total Lecture Hours: 42)

PRACTICAL:
1. Plane force Polygone
2. Forces in space
3. Simple Plane roof truss
4. Coplanar Parallel foces
5. "E" by searle's apparatus
6. Belt Friction
7. Static Surface Friction
8. Gravitational acceleration
9. Mass M.I. of flywheel

REFERENCES:
1. Beer, F.P. and Johnston, E.R., Vector mechanics for engineers: Statics and Dynamics, Tata McGraw-Hill, New Delhi.
2. Desai,J.A. and Mistry, B.B., Engineering Mechanics: Statics and Dynamics, Popular Prakashan, Surat.
3. Hibbeler, R.C., Engineering Mechanics: Statics and Dynamics, Prentice Hall of India, New Delhi.
4. Meriam, J.L. and Kraige, L.G., Engineering Mechanics: Statics and Dynamics, John Wiley and sons, New York.
5. Rajsekaran s, Engineering Mechanics: Statics and Dynamics, Vikas Publication, New Delhi.
6. Shah H. J. and Junarkar S. B., Applied Mechanics, Charotar publication, Anand.
7. Bhavikatti S. S. and Rajashekarappa KG., Engineering Mechanics, Wiley 'Eastern Ltd

Fundamentals of Computer and Programming	L	T	P	Credit
CS 109 S1 **CS 109 S2** **Scheme**	3	0	2	04

- **INTRODUCTION TO COMPUTER AND ITS ARCHITECTURE** (02 Hours)
  Introduction and Characteristics, Computer Architecture, Generations, Classifications, Applications, Central Processing Unit and Memory, Communication between various units, Processor speed, Multiprocessor system, Peripheral Buses, Motherboard Demonstration

- **MEMORY AND VARIOUS INPUT AND OUTPUT DEVICES** (02 Hours)
  Introduction to Memory, Input and Output Devices, Memory hierarchy, Primary memory and its types, Secondary Memory, Classification of Secondary memory, Various secondary storage devices and their functioning

- **NUMBER SYSTEMS** (01 Hours)
  Introduction and type of Number system, Conversion between number system, Arithmetic operations in different number system, Signed and unsigned number system

- **INTRODUCTION TO SYSTEM SOFTWARES AND PROGRAMMING LANGUAGES**
  (04 Hours)
  Classification of Computer Languages, Introduction of operating system, Evolution, type and function of OS, Unix commands, Evolution and classification of programming language, Feature and selection of good programming language, Development of program, algorithm and flowchart, Program testing and debugging, Program documentation and Paradigms, Characteristics of good program

- **WINDOWS OPERATING SYSTEM AND ITS ENVIRONMENT** (02 Hours)
  Introduction to GUI based OS, Configuration, Setup, Services, Network Configuration

- **LINUX OPERATING SYSTEM AND ITS ENVIRONMENT** (02 Hours)
  Introduction to Unix based OS, Configuration, Setup, Services, Scripting, Network Configuration

- **DEBUGGING TOOLS AND COMPILER OPTION** (04 Hours)
  Different debugging tools, Commands, Memory dump, Register and Variable Tracking, Instruction and Function level debugging, Compiler Options, Profile Generation

- **DATA COMMUNICATION, COMPUTER NETWORK AND INTERNET BASICS**
  (02Hours)
  Data communication and transmission media, Multiplexing and Switching, Computer network and network topology, Communication protocols and Network Devices, Evolution and basic internet term, Getting connected to internet and Internet application, Email and its working, Searching the web, Languages of internet, Internet and viruses

- **PROGRAMMING USING 'C' LANGUAGE – INTRODUCTION** (06 Hours)
  Characteristics of C language, Identifiers and keywords, Data types Constants and Variables, Declarations and Statements, Representation of expressions, Classification of Operators and Library Functions for Data input and output statements, Formatted input and output statements

- **PROGRAMMING USING 'C' LANGUAGE – CONTROL STATEMENT, DATA STRUCTURES, POINTERS**   **(06 Hours)**
  Conditional Control Statements, Loop control statements, One dimensional array of numbers and characters, Two-dimensional array, Introduction and development of user defined functions, Different types of Variables and Parameters, Structure and union, Introduction to pointers, Pointer arithmetic, Array of pointers, Pointers and functions, Pointers and structures, File handling operations

- **PROGRAMMING USING 'C' LANGUAGE – FUNCTIONS**   **(06 Hours)**
  Functions, Passing the arguments, Return values from functions, Recursion, Header Files Design, File handling operations, Read and Write to Secondary Devices, Read and Write to Input and Output Ports

- **PROGRAMMING USING 'C' LANGUAGE – GRAPHICS, DEBUGGING**   **(05 Hours)**
  Include Graphics Library, Debugging, Linking, Compilation Option for Optimization, Make file

(Total Lecture Hours: 42)

Practicals will be based on the coverage of the above topics.   **(28 Hours)**

BOOKS RECOMMENDED
1. "Introduction to Computer Science", ITL Education Solutions Limited, Pearson Education, Fourth Impression, 2009.
2. "Programming with C Schaum's outline Series", Gottfried B.S., Outline Series, 2/E, Tata McGraw-Hill, 2006.
3. "The C Programming language", Brian W. Kernighan, Dennis M. Ritchie, 2/E, Prentice Hall PTR publication, 1988.
4. "Programming in ANSI C", E. Balagurusamy, 6/E, Tata Mc-Graw Hill, 2012.
5. "Programming in C", Pradip Dey, 2/E, Oxford University Press, 2012.

English and Professional Communication		L	T	P	Credit
HU 110 S1 HU 110 S2	**Scheme**	3	0	0	03

- **COMMUNICATION** (05Hours)
  Introduction to Communication, Different forms of Communication, Barriers to Communication and some remedies, Non Verbal Communication – Types, Non-Verbal Communication in Intercultural Context

- **COMMON ERRORS** (02Hours)
  Common Errors, Indianisms through *Goodbye Party for Miss Pushpa T.S.* (Poem by Nissim Ezekiel)

- **LISTENING SKILLS** (05 Hours)
  Effective Listening – Process, Types- Appreciative, comprehensive, empathetic, analytical, Modes of Listening-Active and Passive, Listening and note taking practice, Listening for various purposes-Practice and activities

- **SPEAKING SKILLS** (12 Hours)
  Effective Speaking- Informal Speech, JAM, Presentation Skills- types, preparation and practice Interviews- types, preparation and mock interview; Group Discussion- types, preparation and practice

- **READING SKILLS** (05 Hours)
  Reading Skills- **Comprehension (unseen passage- literary /scientific / technical)** Reading with fluency and speed, Skimming and scanning, identifying relevant information, isolating fact from opinion Understanding concepts and arguments, Identifying distinctive features of language

- **WRITING SKILLS** (13 Hours)
  Technical Writing- types and practice, Memo, Letter Writing- types and practice, Email etiquette and Netiquette, Résumé writing- types and practice, Report Writing -types and practice, Editing-practice

  (Total Lecture Hours: 42)

BOOKS RECOMMENDED:
1. Kumar, Sanjay and Pushp, Lata. Communication Skills, 2nd Edition, OUP, New Delhi, 2015.
2. Raman, Meenakshi & Sharma Sangeeta. Technical Communication Principles and Practice, 3rd Edition, OUP, New Delhi, 2015.
3. Sharma R.C. & Mohan Krishna. Business Correspondence and Report Writing, 3rd Edition, Tata McGraw Hill, New Delhi, 2007.
4. Raymond V. Lesikar and Marie E Flatley. Basic Business Communication skills for Empowering the Internet generation. Tata McGraw Hill publishing company limited. New Delhi 2005.
5. Ezekiel, Nissim. Goodbye Party for Miss Pushpa T.S.*,* http://www.english-for-students.com/Goodbye-Party.html

REFERENCE BOOKS:

1. Bovee, Courtland L., Thill, John V., and Chaturvedi, Mukesh. Business Communication Today. 9th Edition. Pearson, 2009.
2. Farahthullah, T.M. Communication Skills for Technical Students, 5th Edition, Orient Blackswan, Kolkatta, 2009.
3. Leech, Geoffery& Svartvil. A Communicative Grammar of English, Longman Group UK Ltd. 2006.
4. Pfeiffer, William Sanborn and Padmaja, T.V.S., Technical Communication: A Practical Approach. 6th edition. Pearson books, 2007.

Workshop Practice		**L**	**T**	**P**	**Credit**
ME 111 S1 **ME 111 S2**	**Scheme**	**0**	**0**	**4**	**02**

List of Practical

- **UNIT 1** **(12 Hours)**
  Introduction of the tools used in carpentry shop and skill development in carpentry works.

- **UNIT 2** **(12 Hours)**
  Introduction of the tools used in Fitting shop and skill development in fitting works.

- **UNIT 3** **(12 Hours)**
  Introduction of the tools used in smithy shop, and skill development in smithy works.

- **UNIT 4** **(12 Hours)**
  Introduction of the tools used in soldering and other joining processes and skill development in soldering and other joining works.

- **UNIT 5** **(04 Hours)**
  Introduction to House writing, different types of cables. Types of power supply, types of motors, Relays and Contractors, ELCB, distribution of power supply, LED lighting, MCB, Electrical wiring symbols, Energy Meter, SPDT/DPDT switches.
  Earthing and Grounding, EMI & EMC issue

- **UNIT 6** **(04 Hours)**
  Identifications of Electronics Components,
  Soldering of components,
  Components Mounting on Bread Board,
  Functioning of Power supply, Function Generator, CRO, DSO.

(Total Practical Hours: 56)

Reference book:

1. H.S. Bava, "Workshop Technology", Tata McGraw Hill Publishing Co. Ltd., 1995.
2. S.K. Hajra Chaudhary, "Elements of Workshop Technology Vol. I", Asia Publishing House, 1988.
3. W.A.J. Chapman, "Workshop Technology", ELBS Low Price Text, Edward Donald Pub. Ltd., 1961
4. Gupta K.N. & Kaushish J.P., "Workshop Technology Vol. I, II", New Delhi Heights Pub., New Delhi, 1991
5. Raghuvanshi B. S., "Course in Workshop Technology", Dhanpat Rai & Sons, New Delhi, 1991.
6. Tejwani V. K. "Basic Machine Shop Practice Vol. I, II", Tata McGraw Hill Pub. Co., New Delhi, 1989.
7. Arora B. D. "Workshop Technology Vol. I, II", Satya Prakashan, New Delhi, 1981.

Physics of Materials and Nuclei		L	T	P	Credit
PH 112 S1 **PH 112 S2**	**Scheme**	4	0	0	04

- **CRYSTALLOGRAPHY** **(10 hours)**
  Crystalline and amorphous solids, Lattice and unit cell, Seven crystal system and Bravais lattices, Symmetry operation, Miller indices, Atomic radius, Coordination number, Packing factor calculation for SC, BCC, FCC, Bragg's law of X-ray diffraction, Laue Method, Powder crystal method.

- **SEMICONDUCTOR PHYSICS** **(06 hours)**
  Introduction, Direct and indirect band gap semiconductors, Intrinsic and extrinsic semiconductors, Law of Mass action, Charge neutrality, Hall effect.

- **NANOMATERIALS** **(10 hours)**
  Introduction and properties, Synthesis: Chemical vapour deposition, Ball milling and relevant applications, Carbon nanotubes: structure and properties and Synthesis: Arc method and Pulsed laser deposition, Applications.

- **MAGNETIC MATERIALS, CONDUCTORS AND SUPERCONDUCTORS** **(10 hours)**
  Magnetic materials: Definition of terms, Classification of magnetic materials and properties, Domain theory of ferromagnetism, Hard and soft magnetic materials, Conductors: Classical free electron theory (Lorentz–Drude theory), Electrical conductivity, Superconductors: Definition, Meissner effect, Type I & II superconductors.

- **STATISTICAL MECHANICS** **(10 hours)**
  Macroscopic and microscopic states, Phase space, Condition for statistical equilibrium, Micro-canonical ensemble, canonical ensemble, Grand-canonical ensemble, Partition function, Bose-Einstein and Fermi-Dirac distribution.

- **NUCLEAR AND PARTICLE PHYSICS** **(10 hours)**
  Nuclear properties and forces, Nuclear models, Shell model, Nuclear reaction, Radioactivity, Types and half-lives, Application in determining the age of rock and fossils, Stellar nucleosynthesis, Fundamental forces, Particle physics, Classification of matter, Quark model, Neutrino properties and their detection.

(**Total Lecture Hours: 56)**

BOOKS RECOMMENDED:

Text Books:
1. R. Resnick and D. Halliday Physics (Part I & II) Wiley 2007
2. A. Beiser Concept of the Modern Physics McGraw-Hill 2008
3. K. Huang Statistical mechanics Willey 2008

Reference Books:
1. M. N. Avadhanulu and P. G. Kshirsagar, A text book of Engineering Physics S Chan 2009
2. C. Kittel Introduction to Solid State Physics Wiley 2016
3. K. K. Chattopadhyay and A. N. Banerjee Nanoscience and Nanotechnology PHI 2014

Mathematics-II		L	T	P	Credit
MA 114 S2	**Scheme**	3	1	0	04

- **ORDINARY DIFFERENTIAL EQUATION** (**10 Hours**)
  Reorientation of differential equation first order first degree, exact differential equation and Integrating factors, first order higher degree odes, solvable for p, y and x, Solution of homogenous equations higher order, complementary functions, Particular Integrals, Linear differential equation with variable coefficient, Cauchy's Euler and Legendre's equation with variable coefficient, Method of variation of parameters.

- **APPLICATION OF DIFFERENTIAL EQUATION (Mathematical Modelling)** (**07 Hours**)
  Modeling of Real world problems particularly Engineering System, Electrical network models (LCR), spread of epidemic (SI, SIS, SIR), Newton's Law of cooling, Single compartment modelling, Bending of beam models.

- **SERIES SOLUTION AND SPECIAL FUNCTIONS** (**07 Hours**)
  Regular point, Singular point, series solution of ODE of 2nd order with variable coefficient with special emphasis to differential equation of Legendre's and Bessel's for different cases of roots of indicial equations.

- **INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATION** (**07 Hours**)
  Introduction to Partial differential equation, Formation of partial differential Equation, Partial differential Equation of first order, Linear partial differential equation of first order ($P\mathbf{p} + Q\mathbf{q} = R$) and method of obtaining its general solution, Non-linear partial differential equation of first order $f(\mathbf{p}, \mathbf{q})=0$, $f(z, \mathbf{p}, \mathbf{q})=0$, $f(x, \mathbf{p})= g(y, \mathbf{q})$, $z= \mathbf{p}x + \mathbf{q}y + f(\mathbf{p}, \mathbf{q})$.

- **VECTOR CALCULUS** (**07 Hours**)
  Scalar and vector point function, differential operator, gradient, directional derivative, divergence, curl and Laplacian operator with their properties, Line integral, Surface Integral, Volume integral, Green's, Gauss and Stokes theorem (Only statement) & application.

- **SYSTEM OF LINEAR ALGEBRIC EQUATION** (**04 Hours**)
  Linear systems, Elementary row and column transformation, rank of matrix, consistency of linear system of equations, Linear Independence and Dependence of vectors, Gauss Elimination method, Gauss-Jorden Method, Gauss-Jacobi Iteration Method.

  (Total Lecture Hours: 42)

Books Recommended:
1. Kreyszing E., "Advanced Engineering Mathematics", John Wiley & Sons, Singapore, Int. Student Ed. 2015.
2. James Steward De, "Calculus", Thomson Asia, Singapore, 2003.
3. O'Neel Peter., "Advanced Engg. Mathematics", Thompson, Singapore, Ind. Ed. 2002.
4. F. B. Hilderband, "Methods of Applied mathematics", PHI, New Delhi, 1968
5. Wiley C. R., "Advanced Engineering Mathematics", McGraw Hill Inc., New York Ed. 1993.

Reference Books
1. Ramana D. V., "Higher Engg. Mathematics", The MaGraw-Hill Inc., New Delhi, 2007.
2. Hay George E., "Vector and Tensor Analysis". Dover Publications, 2012.
3. Srimanta Pal, Subodh C. Bhunia, "Engineering Mathematics", Oxford University Press, New Delhi, 2015.
4. Mary L. Boas, Mathematical Methods in the Physical Sciences, John Wiley & Sons, Ed.2005.
5. J. N. Kapur , Mathematical Models in Biology and Medicine. East west Press, New Delhi 1985.

Branch Specific Courses

Branch Specific Courses for Civil Engineering Department

Introduction to Surveying		**L**	**T**	**P**	**Credit**
CECE 102 S1	**Scheme**	**3**	**0**	**2**	**04**

- **BASIC CONCEPT OF SURVEYING** (06 Hours)
  Role of Civil Engineer in Surveying, Definition, Basic measurements, Scale and Mapping, Types of Maps and their uses, Map sheet numbers, Map projections, Principles of Surveying, Classification of Surveying, Division of Surveying, Control networks, Locating position and topographic detail

- **MEASUREMENT OF DISTANCE** (06 Hours)
  Linear Measurement, Chain and Tapes, Field work, Distance adjustment, Errors in taping, Accuracies, Optical distance measurement (ODM), Electromagnetic distance measurement (EDM)

- **MEASUREMENT OF ANGLES** (12 Hours)
  Angle Measurement, Bearing and Direction, Equipment viz. Compass and Theodolite, Field procedure, Measurement of Horizontal and Vertical Angles, Method of Repetition, Method of Reiteration, Theodolite Traverse, Adjustment of traverse, Gale's Traverse Table

- **VERTICAL CONTROL** (10 Hours)
  Definitions, Principle of leveling, Methods of leveling, About Equipment, Instrument adjustment, Different types of Leveling, Curvature and refraction, Leveling applications viz. Reciprocal leveling, Profile leveling and cross sectioning, Precise leveling, Digital leveling, Trigonometrical leveling, Contouring and Characteristics of Contours

- **PLANE TABLE SURVEY** (04 Hours)
  Definitions, Plane table accessories, Advantages & Disadvantages, Methods of plotting – Radiation, Intersection & Traversing.

- **LAYOUT SURVEYS** (04 Hours)
  Protection and referencing, Basic setting-out procedures using coordinates, Technique for setting out a direction, Use of grids, Setting out buildings, Roads etc., Controlling verticality, Controlling grading excavation

  (Total Lecture Hours: 42)

PRACTICALS / DRAWING*:
1. Study of various types of maps and symbols used
2. Introduction of Various Basic Surveying Equipments
3. Introduction of Leveling Equipment
4. Exercise on Leveling (Differential Method)
5. Exercise on Profile leveling/Cross Sectioning and contouring
6. Introduction of Angle Measuring Equipment 1 – Various types of Compass
7. Introduction of Angle Measuring Equipment 2 – Vernier Theodolite
8. Introduction of Angle Measuring Equipment 3 – Digital Theodolite
9. Measurement of Horizontal angels by Repetition and Reiteration method
10. Exercise on Theodolite Traversing
11. Introduction of Area Measuring Equipment – Plannimeter (Mechanical and Digital)
12. Evaluation of Area of map with irregular boundary
13. Setting out of a building
14. Final Submission

Student has to prepare a journal with description of practical as well as to prepare drawing of given exercise in prescribed drawing sheet by the teacher and has to submit the same.

BOOKS RECOMMENDED:

1. W. Schofield, "Engineering Surveying", Butterworth-Heinemann Publication, New Delhi(2001)
2. Arora K. R., "Surveying and Levelling, Vol. I & II", Standard Publications, Delhi (2000).
3. Kanitkar T.P. & Kulkarni S.V., "Surveying and Levelling, Vol. I & II", Vidyarthi Gruh Prakashan, Pune(1995).
4. Punmia B.C., "Surveying and Levelling, Vol. II & III", Laxmi Publications Pvt. Ltd., New Delhi(1994)
5. Basak, N. N., "Surveying and Levelling", Tata McGraw-Hill Publishing Co. Ltd., New Delhi(1994)

Building Technology		L	T	P	Credit
CECE 113 S2	Scheme	3	0	2	04

- **BUILDING MATERIALS** (12 Hours)
  Types of stones and bricks,uses and tests, building codes, I.S.specifications, manufacturing process, tiles, stone ware pipes ,Types of limes and cements, applications in building construction, Characteristics and tests.
  Mortars, mix proportions and uses, cement concrete, mixes and uses, formworks, placing, compacting and curing , reinforced concrete, reinforcement of foundations, columns, beams and slabs, formworks.
  Timber, polymers and plastics, energy saving materials, aluminum, glass, paints, surface coatings.

- **BUILDING STRUCTURAL COMPONENTS** (12 Hours)
  Foundations: Objectives, types, field applications, failures, precautionary measures.
  Maonary**:** Brick and stone, bonds, cavity, composite and partition walls, arches.
  Concrete: Plain, R.C.C., Prestressed, Precast concrete, slabs, beams, columns, lintels chajjas, cantilever, Formwork, ready mix concrete plant,batching,mixing,testing laying and curing, Strengths of concrete
  Timbering: Scaffolding, Shoring, Underpinning
  Flooring: Types , conventional flooring, terrazzo, mosaic tiles, IPS floor, timber and jack arch floors, tiles, rubber, PVC covering, leak proof techniques.

- **BUILDING JOINERY SYSTEMS** (8 Hours)
  Openings and staircases**:** Doors, windows, ventilators, nomenclature, fixtures and choices, Staircase terminology, types, structural forms, selection criteria
  Roofs**:** Types, terminology, Trusses, special roofs, coverings, ACC and GI sheets.
  Finishes: Plastering, pointing, mortar proportions, choices, white and colour washing, distempering, cement painting, varnishing and painting of woodwork and steel, weathering effects.

- **ELEMENTS OF BUILDING PLAN** (4 Hours)
  Basics and practice of building plan drawings, Basic AutoCad commands for building plans.

- **BUILDING AND ENVIRONMENT:** (6 Hours)
  Building materials, environment and carbon emission, Concept of Green buildings and rating systems LEED and GRIHA, Role of IGBC, CBRI

  (Total Lecture Hours: 42)

BOOKS RECOMMENDED:
1. Arora D. S., "Geology for Engineers ", Mohindra Capital Publishers, Chandigarh.(1992)
2. Arora and Bindra , " A Textbook of Building Construction " , DhanpatRai& Sons, New Delhi. (1993)
3. Barry , " Building Constructions", Vol. I , II & III , ELBS Publications. (1989)
4. Ghosh D. N., " Materials of Construction ", Tata McGraw Hill Publication, New Delhi. (1991)
5. McCay , " Building Construction " , Vol. I , II & III , ELBS Publications. (1986)
6. Chudley, "Construction Technology – Volumes 1 and 2," 2nd Edition, Longman, UK, (1987).
7. Mehta Madan, Scarborough Walter, and Armpriest Diane, "Building Construction – Principles, Materials, and Systems" 2nd Edition, Pearson Education Inc.USA, (2008)
8. Edward Allen and Joseph Iano, "Fundamentals of Building Construction: Materials and Methods", Wiley Publication, (2008)

Branch Specific Courses for Computer Engineering Department

Electrical Networks		**L**	**T**	**P**	**Credit**
CSEE 102 S1	**Scheme**	**3**	**0**	**2**	**04**

- **AC FUNDAMENTALS AND CIRCUITS** (07 Hours)
  Alternating voltages and currents through purely resistive inductive and capacitive circuits, R-L, R-C, R-L-C series circuits, impedance and admittance, circuits in parallel, series and parallel resonance, Complex algebra and its application to circuit analysis, Circuit Transient, Initial and Final Value Theorem, DC and Induction Machines, Electrical Measurements, Power System

- **POLYPHASE CIRCUITS AND TRANSFORMES** (04 Hours)
  Balanced three phase systems, Star and Mesh connections, Relation between Line and Phase quantities, Measurement of power, Principle of transformer, construction, transformer on no-load, with load, phasor diagram for transformer under no-load and loaded condition (with unity, lagging power factor load) equivalent circuit, open circuit and short circuit test, efficiency, voltage regulation.

- **NETWORK CONCEPTS** (04 Hours)
  Network element symbols and conventions, Active element conventions, current and voltage conventions, loops and meshes, Nodes, coupled circuits and Dot conventions.

- **MESH CURRENT AND NODE VOLTAGE NETWORK ANALYSIS** (07 Hours)
  Kirchhoff's Voltage Law, Kirchhoff's Current Law, Definitions of mesh current and nodal voltage, Choice of mesh currents or nodal voltages for network analysis, Self and mutual inductances, Mesh Equation in the Impedance Matrix Form by inspection, Solution of Linear Mesh Equations, Nodal Voltage Analysis Nodal Equations in the Form of Admittance Matrices by inspection, Solution of Linear Nodal Equations.

- **NETWORK THEOREMS AND GRAPH** (07 Hours)
  Linearity and Superposition, Independent and Dependent Source and their Transformations, Thevenin, Norton, Reciprocity and Maximum Power Transfer Theorems, Use of these theorems in Circuit Analysis, Duality and Dual of a Planner Network, Fundamental Concepts, Definition of Graph and Various Related Terms, Paths and Circuits Connections, Tree Of a Graph, Cut Sets and Tie Sets, Non-separable Planner and Dual Graphs, Matrices of Oriented Graphs, Properties and Inter-Relationship of Incidence, Tie Set and Cut Set Matrices, Complete Analysis Using Tie Set and Cut Set Matrices.

- **WAVE FORM ANALYSIS BY FOURIER SERIES** (06 Hours)
  Trigonometric and complex exponential forms, the frequency spectra of periodic wave forms, the Fourier Integral and continuous frequency spectra, Fourier transform and their relationship with Laplace transform.

- **NETWORK FUNCTIONS AND TWO PORT PARAMETERS** (07 Hours)
  Poles and zeros of a function, physical and analytical concepts, Terminal and terminal pairs, Driving point immitances, Transfer functions, Definitions, calculations and interrelationship of impedance, admittance, hybrid and transmission line parameters for four terminal networks. Image impedance and its calculations for symmetrical and unsymmetrical π, T and Ladder Networks.

(Total Lecture Hours: 42)

PRACTICALS

1. To study Ammeter and Voltmeter for current and voltage measurement in circuit
2. To study Energy meter
3. To study Power measurement method for three phase circuits using watt meter method
4. Verification of superposition theorem for electric circuit
5. Verification of Thevenin's theorem of electric circuit
6. Calculation and verification Norton's theorem
7. Open circuit and short circuit test for the transformers for efficiency calculation
8. Verification of Kirchhoff's current law and Kirchhoff's voltage law for electric circuit
9. Capacitance measurement of parallel plates
10. Calculation of efficiency of auto transformer

BOOKS RECOMMENDED

1. "Engineering Circuit Analysis", W.H.Hyat, J.E.Kemmerly, S.M.Durbin, 6thEdition, TMH, 2006.
2. "Network Analysis", Van Valkenburg M E, 3rd Edition, PHI, 2002.
3. "Network Theory, Analysis & Synthesis", Samarjit Ghosh, PHI, 2005.
4. "Network Analysis & Synthesis", C.L.Wadhwa, Revised 3rdEdition, New Age International Publishers, 2007.
5. "Basic Electrical Engineering", Kothari and Nagrath, 2nd edition, 2007, Tata McGraw-Hill Education.
6. "Basic Electrical Engineering", V. N. Mittle & Arvind Mittal, 2nd edition, 2005, Tata McGraw-Hill Education.

	L	T	P	Credit
Web Programming				
CSCS 113 S2 **Scheme**	3	0	2	04

- **INTRODUCTION** (04 Hours)
  Basics of Internet, World Wide Web, HTTP protocol, Universal resource locator, Web Server, Different types of Web Servers, Domain Name Server, Web Server Configuration, Internet Browser, Web document and Mark-up language, Hypertext mark-up language, Hyper media, Web site organization, Content organization, Web server on different operating system platforms, Web Applications, Web interface, Web Standards & Accessible Design.

- **WEB DESIGNING: STATIC WEB PAGES** (08 Hours)
  Web page, Static web page, Hypertext mark-up tags, Handling font style, types, size, colour etc., Handling table, list, images, graphics, menu etc.,

- **WEB DESIGING: DYNAMIC WEB PAGES** (08 Hours)
  Forms, Input Text box, Drop down menu, Name variable, Cookie management, Session management, Animation, Structure web pages, Image mapping, Link setup in image, Frames, Structuring web pages using Frames, Multimedia handling, Linking to Pages.

- **DYNAMIC WEB PAGES AND SCRIPTING** (08 Hours)
  Scripting language, Dynamic pages and Forms validation, Validation of Input Text box, Dynamic Drop down menu, Validation and accessing Name variable-value pair, Cookie management through scripting, Session management through scripting, Animation through scripting, Dynamic Image mapping through scripting, Link handling through scripting, Multimedia handling through scripting.

- **WEB PAGE STYLE SHEET** (04 Hours)
  Web page designing using Style Sheet, Different types of style sheet, Defining different styles, Export and Importing Style Sheet, Cascade style sheet.

- **PYTHON PROGRAMMING** (08 Hours)
  Basics of Python programming: variables, controlling statements, functions, Introduction to Module packages, Web designing with Python.

- **WEB HOSTING AND PUBLISHING** (02 Hours)
  Different steps of Web hosting and publishing, Documents Interchange Standards, Website Evaluation, Components of Web Publishing, Document Management, Search Engines, Registration of a Web Site on search Engines, Publishing Tools.

  (Total Contact Time: 42 Hours)

Practicals will be based on the coverage of the above topics. (28 Hours)

PRACTICALS
1. To study web server setup.
2. To study web server configuration.
3. Static web page designing using hypertext mark-up tags.
4. Dynamic web page designing.
5. Dynamic web page designing using script langue.
6. Web page designing using different style sheets.
7. Basic Python programming exercise to familiar with variables and control statements, functions and packages.
8. Web page designing using Python.

BOOKS RECOMMENDED

1. B. Underdahle and K. Underdahle, "Internet and Web Page/ Website design", 2/E, IDG Books India (P) Ltd., 2001.
2. D. Comer, "The Internet Books," 2/E, Prentice Hall of India, 2001.
3. J. Sklar, "Principles of Web Design", 7/E, Cengage Learning; 2017.
4. H. Deitel, A. Deitel, "Internet and World Wide Web How To Program", 5/E, Pearson, 2012.
5. M.L. Young," The Complete reference of Internet", Tata Mc Graw Hill, 2002.
6. W.G. Lehnert, "Internet 101, 1/E, Person Education, 2001.
7. Jon Duckett, "HTML & CSS Design and Build Websites", John Wiley & Sons, Inc., 2011.
8. Thomas Powell and fritz Schneider, "JavaScript: The Complete Reference, McGraw-Hill, 2017.
9. Martin C. Brown, "Python: The Complete Reference, Osborne / McGraw-Hill, 2018.

Branch Specific Courses for Chemical Engineering Department

Introduction to Chemical Engineering		L	T	P	Credit
CHCH 102 S1	**Scheme**	3	1	0	04

- **INTRODUCTION** (5 Hours)
  Introduction: Unit operations, basic laws, useful mathematical methods, unit and dimensions, dimensional analysis, monography

- **PHYSICO-CHEMICAL CALCULATIONS** (4 Hours)
  Introduction: Energy, equivalent mass, solutions, electrochemical processes, hardness of water, humidity and saturation

- **MATERIAL AND ENERGY BALANCE** (4 Hours)
  Introduction: Material balance, energy balance

- **FLOW OF FLUIDS** (4 Hours)
  Introduction: nature of fluid, viscosity, flow field, flow of a fluid past a solid surface, conservation of mass and energy, friction losses in laminar and turbulent flow, fluidization, cavitations, pumping of fluids

- **HEAT TRANSFER** (4 Hours)
  Introduction: Conduction, convection, radiation, flow arrangement in heat exchanger, temperature profile of fluids in heat exchanger, heat transfer equipments, evaporation

- **MASS TRANSFER** (5 Hours)
  Introduction: Diffusion, mass transfer operations, absorption, vapour-liquid equilibrium, relative volatility, boiling point diagram, distillation, reflux, terminology and equipment of gas-liquid mass transfer operation, liquid-liquid extraction, classification of industrial liquid-liquid contactors, crystallization, drying, adsorption

- **CHEMICAL KINETICS** (4 Hours)
  Introduction: Thermodynamic review, determination of the rate equation, effect of temperature, catalysis, reactors, some useful terms in chemical processing

- **MEASURING DEVICES** (2 Hours)
  Chemical composition, pressure, temperature, and flowrate measurement, other common parameter measurements

- **COMPUTERS AND CHEMICAL ENGINEERING** (4 Hours)
  Introduction to Mathematical Software Packages, writing codes in C-Language and or MATLAB to solve common chemical engineering problems. Validation of the same using MS Excel (graphical as well as numerical problems)

- **NATURAL RESOURCES AND THEIR UTILIZATION** (3 Hours)
  Introduction: Renewable raw materials, non- renewable raw materials

- **SAFETY, HEALTH, ENVIRONMENT AND ETHICS** (3 hours)
  Introduction: Safety and chemical Engineering, health issues, environment concerns and ethics

(Total Lecture Hours: 42 + Tutorial Hours: 14)

BOOKS RECCOMENDED

1. Salil K Ghosal, Siddhartha Datta, Shyamal K Sanyal, Introduction to Chemical Engineering, Tata McGraw - Hill Publication, 2004.
2. S. Pushpavanam, Introduction to Chemical Engineering, PHI Learning Pvt. Ltd., 2012.
3. Vivek Utgikar, Fundamental Concepts and Computations in Chemical Engineering, Prentice Hall, 2017.
4. Walter L Badger and Julius T Banchero, Introduction to Chemical Engineering, McGraw – Hill Publication, 1955.
5. D. M. Himmelblau, J. B. Riggs, Basic Principles & Calculations in Chemical Engineering Prentice Hall (India), 2012.
6. L. B. Andersen & L. A. Wenzel, Introduction to Chemical Engineering by McGraw Hill Publication, 1961.

Process Calculations		L	T	P	Credit
CHCH 113 S2	**Scheme**	3	1	0	04

- **INTRODUCTION** (4 Hours)
  Introduction, Dimension and Units, system of units, conversion of units and equations, dimensional homogeneity and dimensionless quantities

- **BASIC CHEMICAL ENGINEERING CALCULATIONS** (5 Hours)
  Process Variables: Density, Flowrate, Pressure and Temperature, moles, average molecular weight, Chemical Composition. Equation of States for Gases, Phase Equilibria

- **MATERIAL BALANCE ON NON-REACTIVE SYSTEMS** (4 Hours)
  Law of conservation of mass, differential and integral balances, Material balances for unit operations including distillation, evaporation, drying, crystallization, extraction, mixing, gas absorption

- **MATERIAL BALANCE ON NON-REACTIVE SYSTEMS WITH MULTIPLE UNITS AND RECYCLE** (4 Hours)
  Balances on multiple unit operations with recycle, bypass systems, Degree of freedom analysis for non-reactive systems

- **MATERIAL BALANCE ON REACTIVE SYSTEMS** (4 Hours)
  The chemical equation and stoichiometry, Different approaches to solve material balance problems such as molecular balance, atomic balance and extent of reaction for reactive processes

- **MATERIAL BALANCE ON REACTIVE SYSTEMS WITH MULTIPLE UNITS AND RECYCLE** (5 Hours)
  Material balances on reactive system with recycle, bypass and purge systems, Degree of freedom analysis for reactive systems

- **ENERGY BALANCE WITH AND WITHOUT REACTIVE** (5 Hours)
  Law of conservation of energy, Energy balance for closed and open system, calculations of enthalpy changes of processes

- **ENERGY BALANCE WITH CHEMICAL REACTION** (8 Hours)
  Calculations of enthalpy changes of reactions, heats of reaction, heat capacity calculations, Formation reactions and heats of formation and combustion, energy balances for reactive systems, Combustion reactions. Estimation of calorific values of fuels

- **MATERIAL BALANCES ON UNSTEADY STATE PROCESSES** (3 Hours)

(Total Lecture Hours: 42 + Tutorial Hours: 14)

BOOKS RECCOMENDED
1. Felder R. M. & Rousseau R.W., "Elementary principles of chemical processes", 3rd Ed., John Wiley & Sons, Inc., New York, 2000.
2. Himmelblau D.M., "Basics Principles and Calculations in Chemical Engineering" 6th Ed., Prentice-Hall India,1996.
3. Bhatt B.I. & Vora S.M., "Stoichiometry", 4th Ed., Tata-McGraw-Hill, New Delhi, 2004.
4. Hougen O.A., Watson K.M. & Ragatz R.A., "Chemical Process Principals: Part-I", 2nd Ed., CBS Publishers and Distributors, New Delhi, 1995.

Branch Specific Courses for Electrical and Electronics Engineering Department

Basic Electrical Engineering		L	T	P	Credit
EEEE 102 S1 **ECEE 102 S1**	**Scheme**	3	0	2	04

MAGNETIC CIRCUIT AND ELECTROMAGNETIC INDUCTION (08 Hours)
Amperes circuital law, analogy between electric & magnetic circuits, fringing, leakage, series, parallel, series-parallel circuits, Faradays law, Lenz law, self-inductance, mutual inductance, coefficient of mutual inductance, coefficient of coupling, inductance in series, parallel, series-parallel, Analysis of coupled coils, dot rule, conductively coupled equivalent circuit.

SERIES AND PARALLEL AC CIRCUITS (06 Hours)
Complex algebra and its application to circuit analysis, R-L, R-C, R-L-C series and parallel circuits, series and parallel resonance.

ELECTRICAL NETWORKS ANALYSIS (10 Hours)
Kirchhoff's Voltage Law, Kirchhoff's Current Law, independent and dependent sources, Mesh current and Nodal Voltage analysis, Super position theorem, Thevenin's theorem, Norton's theorem, Reciprocity theorem, Maximum power transfer theorem

POLYPHASE CIRCUITS (06 Hours)
Balanced three phase systems, star and mesh connections, calculations for balanced and unbalanced three phase networks, polyphase vector diagram, and measurement of power in three phase circuits.

SINGLE PHASE TRANSFORMERS (04 Hours)
Principle of transformer, construction - shell type, core type, transformer on no-load, with load, phasor diagram for transformer under no-load and loaded condition (with unity, lagging power factor load) equivalent circuit, open circuit and short circuit test, losses in the transformer, efficiency, voltage regulation.

THREE-PHASE INDUCTION MOTORS (04 Hours)
Rotating magnetic field, types of induction motor, Principle of operation, slip, different power stages, efficiency of the induction motor.

ELECTRIC WIRING AND ILLUMINATION (04 Hours)
Circuits in domestic wiring, simple control circuit in domestic installation, Types of lamps, fixtures & reflectors, illumination schemes for domestic, industrial & commercial premises, Lumen requirements for different categories, working principle of tube light (fluorescent tube) , LED.

Total Lecture Hours: 42

List of Practical
1. Power measurement in single phase R-L series circuit.
2. Power measurement in single phase R-C series circuit.
3. To study the working principle of tube light and fan.
4. Hysteresis loop on CRO.
5. Study the different types of wiring in electrical engineering.
6. Determination of single phase transformer equivalent circuit parameters using open-circuit and short circuit test.
7. Load test on single phase transformer.
8. Three phase power measurement using two wattmeter method.
9. Star- delta connection of three phase circuit.

BOOKS RECOMMENDED:

1. V. N. Mittle and Arvind Mittal, "Basic Electrical Engineering", 2nd edition, Tata McGraw-Hill Education 2005.
2. Edminister Joseph A., "Electrical circuits", Schaum's outline series, McGraw hill, 2nd edition, 1983
3. B. L. Theraja and A. K. Theraja, "A text book of Electrical Technology: Volume I: Basic Electrical Engineering", S. Chand, 2013.
4. Kothari Nagrath, " Basic Electrical Engineering", 2nd edition, Tata McGraw-Hill Education 2007.
5. A. chakrabarti, M. L. Soni, P.V. Gupta, U. S. Bhatnagar, "Power System Engineering", Dhanpatrai & Co., Second edition, 2013.
6. A.Chakrabarti, " Circuit Theory", Dhanpat Rai & Co. , Sixth edition, 2012

Electronic Devices and Circuits		L	T	P	Credit
EEEC 113 S2					
ECEC 113 S2	**Scheme**	**3**	**0**	**2**	**04**

- **SEMICONDUCTOR DIODES AND APPLICATIONS** (10 Hours)
  Quantitative theory of pn diode, volt-ampere characteristics and its temperature dependence, narrow- base diode, transition and diffusion capacitance of p-n junction diodes, breakdown of junctions on reverse bias, small signal models of diode, PN diode Application as Rectifier, Half Wave Rectifier, Center Tap and Bridge Rectifier, Filter circuits, C, LC and pie filter with circuit Diagram and waveforms.
  Zener Diode theory, Construcion, Operation with forward and reverse VI characteristics, Zener Voltage Regulator, construction and application of Schottkey and Varactor Diodes.

- **BIPOLAR JUNCTION TRANSISTOR ANALYSIS AND DESIGN** (08 Hours)
  Introduction to BJT, IV characteristics, Analysis of CE Configuration: Current Amplification in the Transistor Circuits, Power Calculations, Bypass Capacitor, Coupling Capacitors, concept of AC and DC Load Lines, Different DC Biasing Methods, Fixed Bias, Emitter Stabilized Bias, Potential Divider Bias, DC Bias with voltage Feedback, Common Base Configuration Analysis, Emitter follower, Charge Storage and transient response, small signal models of BJT, Ebers-Moll Model of BJT.

- **FIELD EFFECT TRANSISTOR CIRCUITS** (08 Hours)
  Introduction to FET, Bias stability in FET, Different FET Configuration, Analysis of CS, CG and CD Configuration, Voltage Biasing Techniques, Common Source Amplifier, MOS capacitor, Depletion Mode and Inversion, MOSFET Operation and Enhancement Mode of MOSFET, Transfer Characteristics.

- **SMALL SIGNAL LOW FREQUENCY ANALYSIS AND DESIGN** (08 Hours)
  Hybrid Parameters, CE Configurations, CB Configurations, CS Configurations, CD Configuration, Impedance Reflections, Phase Splitter.

- **DEVICES USED FOR POWER ELECTRONICS** (08 Hours)
  Diac,UJT, SCR, Triac, Power MOSFET and IGBT,

  (Total Lecture Hours: 42)

PRACTICALS
1. Diode Characteristic
2. Rectifiers and Filters
3. Zener as a voltage Regulator
4. BJT Characteristics
5. BJT Biasing Methods
6. FET Characteristics
7. FET Biasing Methods
8. MOSFET Inverter
9. Common Emitter Amplifier
10. Common Source Amplifier
11. SPICE Modeling of Diode, BJT and MOSFET
12. MINI - PROJECT

BOOKS RECOMMENDED

1. Schilling Donald L. and Belove E., "Electronics Circuits- Discrete and Integrated", McGraw-Hill, 3rd Ed., 1989, Reprint 2008
2. Boylestad Robert L. and Nashlesky Louis, "Electronics Device & Circuits Theory", PHI, 10th Ed., 2009
3. Millman Jacob, Halkias Christos C. and Parikh C., "Integrated Electronics", McGraw-Hill, 2nd Ed., 2009
4. D. A. Neamen, Semiconductor Physics and Devices (IRWIN), Times Mirror High Education Group, Chicago) 1997
5. J. Milman and A. Grabel, Microelectronics, McGraw Hill, International, 1987. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College Publishing, 1991

Branch Specific Courses for Mechanical Engineering Department

Fundamental of Thermal and Fluid Engineering	L	T	P	Credit
MEME 102 S1 **Scheme**	3	0	2	04

- **INTRODUCTION TO THERMODYNAMICS**   **(12 Hours)**
  Classical thermodynamics & statistical thermodynamics, Thermodynamic system, properties, states, processes, cycle, equilibrium, Zeroth law of thermodynamics, Definition of work & heat and their evaluation for various thermodynamics processes , P-V-T behavior of a pure substance, Critical & triple point of a pure substance, Mollier diagram, Determination of dryness fraction of steam, Equation of state for ideal gas, Change in entropy, internal energy, enthalpy of gas in various thermodynamics processes. First law of thermodynamics for flow and non-flow processes, Application of first law of thermodynamics to boilers, engines, turbines, and compressors

- **INTRODUCTION TO FLUID MECHANICS**   **(12 Hours)**
  Classification of fluids, Properties of fluids, Types of fluid flow, Static forces on surfaces, buoyancy and metacenter, Motion of fluid particles and streams, Continuity equations for 2-D and 3-D flow in Cartesian coordinates.

- **FUELS AND LUBRICANTS**   **(04 Hours)**
  Classification of fuels, Calorific values of fuels, Dulong's formula, Proximate and ultimate analysis of fuel, Types of lubricants, Properties of lubricants, flash point, fire point, viscosity, vapor pressure, cloud point, pour point, etc.

- **STEAM GENERATORS**   **(04 Hours)**
  Steam generators, Definition, Classification, General study of Cochran, Babcock Wilcox, Lancashire and Benson boilers, boilers mountings and accessories, Types of draught, Calculation of chimney height, boiler efficiency and numericals, Layout of thermal power plant.

- **INTERNAL COMBUSTION ENGINES**   **(05 Hours)**
  Air standard cycles: Otto cycle, Diesel cycle, and Dual cycle with numericals, Classification of internal combustion engines, Spark ignition and compression ignition engines, two-stroke and four-stroke engines, various efficiencies.

- **REFRIGERATION AND AIR-CONDITIONING**   **(05 Hours)**
  Unit of refrigeration, Coefficient of performance, Refrigerants, Vapour Compression refrigeration system, Domestic refrigerator, Psychrometric terms, Window and split air conditioners, Central air conditioning systems, Ice plant.

(Total Lecture Hours: 42)

PRACTICALS:
1. Determination of calorific value of solid fuels by Bomb Calorimeter
2. Determination of flash point and fire point of a given sample of oil.
3. Determination of viscosity of oil by viscometer (Redwood or Saybolt).
4. Study of working of 2-stroke and 4-stroke SI and CI engines
5. Study of different types of steam generators
6. Study of mountings and accessories of steam generators
7. Study of working of refrigerator and air conditioner
8. Study and determination of COP of ice plant
9. Determination of different types of flow patterns by Reynolds's experiment.
10. Determination of metacentric height of floating body.

BOOKS RECOMMENDED:

1. P. K. Nag. Engineering thermodynamics, 6th Edition, McGraw Hill, 2017.
2. R. K. Rajput. Thermal Engineering, 10th Edition, Laxmi Pubications, 2018.
3. G. Rogers and Y. Mayhew. Engineering thermodynamics: work and heat transfer, 4th Edition, Pearson Education India, 2002.
4. S. K. Som, G. Biswas and S. Chakraborty. Introduction to fluid mechanics and fluid machines, 3rd Edition, McGraw Hill, 2017.
5. D. S. Kumar. Fluid mechanics and fluid power engineering, S. K. Kataria and Sons, 2013.

Fundamental of Materials and Manufacturing		**L**	**T**	**P**	**Credit**
MEME 113 S2	**Scheme**	**3**	**0**	**2**	**04**

- **ENGINEERING MATERIALS** **(14 Hours)**
  Classification of engineering materials, Metals (ferrous and non-ferrous) and alloys, Ceramics, Polymers (thermosets and thermoplastics), Composites (metal-matrix, ceramic-matrix, polymer-matrix), Semi-conductors, Bio-materials, Nano-materials, and Advance materials, Engineering properties of materials, Stress- Strain relationship, Effect of temperature on properties of materials.
  Crystalline structure, Nano-crystalline structure, Types of crystal systems, Crystal lattice, Lattice parameters, Metallic structures, Miller indices, Atomic radius & atomic packing factors for various crystal systems, Crystalline materials, Amorphous materials, Structure determination by X-ray diffraction, Bragg's law.

- **METAL CASTING PROCESSES** **(10 Hours)**
  Overview of casting processes, Applications – materials and products, Sand casting process – types of patterns, pattern allowances, core and mould making, molding materials, types of cores, elements of riser and gating system, melting and pouring, cleaning of castings, casting defects, Special casting techniques such as – permanent mould casting, shell mould casting, die casting, investment casting, continuous casting and centrifugal casting.

- **METAL FORMING PROCESSES** **(8 Hours)**
  Overview of metal forming processes, Applications - materials and products, Nature of plastic deformation, Temperature in metal forming, Forming processes - Rolling, Forging, Extrusion, Drawing (wire, bar and tube), and Sheet metal forming.

- **WELDING AND ALLIED PROCESSES** **(10 Hours)**
  Overview of welding processes, Weld joints, Gas welding (Principles of gas welding, types of gases used, types of flames, welding techniques, equipment used, filler rods), Gas cutting, Electric arc welding processes - manual metal arc welding, flux cored arc welding, gas tungsten arc welding (GTAW), gas metal arc welding (GMAW), submerged arc welding, Electric resistance welding processes – spot welding, seam welding, projection welding, upset welding, flash welding, Solid state welding processes – friction welding, friction stir welding, ultrasonic welding, Weld defects, Allied processes like brazing, soldering and adhesive bonding.

(Total Lecture Hours: 42)

BOOKS RECOMMENDED:

1. M. P. Groover, Fundamentals of Modern Manufacturing, Materials, Processes, and Systems, 4th Edition, John Willey, 2010.
2. S. Kalpakijan and S. R. Schmid, Manufacturing Processes for Engineering Materials, 6th Edition, Pearson Education, 2018.
3. P. N. Rao, Manufacturing Technology – Vol. 1, 5th Edition, McGraw Hill, 2018.
4. V. Raghavan, Materials Science and Engineering: A First Course, 6th Edition, Prentice Hall India, 2015.
5. J. T. Black and R. A. Kohser, DeGarmo's Materials and Processes in Manufacturing, Wiley India, 2017.

Experiments to be performed

1. Testing of clay content of moulding sand.
2. Determination of grain fineness number of moulding sand.
3. Determination of moisture content of moulding sand.
4. Demonstration of permanent mould casting process
5. Demonstration and practice on manual metal arc welding
6. Demonstration of the effects of the welding parameters on GTAW process
7. Demonstration and practice on oxy-acetylene gas welding
8. Demonstration of the effects of the welding parameters on oxy-acetylene gas welding
9. Demonstration and practice on gas cutting
10. Practice on soldering of galvanized steel
11. Demonstration of selected forming operations

Branch Specific Courses for Applied Chemistry Department

	L	**T**	**P**	**Credit**
Chemistry-I				
CYCY 102 S1 Scheme	3	0	2	04

ATOMIC STRUCTURE AND BONDING [12 Hours]

De Broglie principle, postulates of quantum mechanics, Schrödinger wave equation:
Derivation, significance of Ψ^2, Schrodinger wave equation for H-atom and particle in 1-D box, angular and radial wave function, Valence Band Theory, Valence Shell Electron Pair Repulsion theory, hybridization, geometry and shape of molecules, Molecular Orbital Theory, molecular orbital diagrams of diatomic and simple polyatomic molecules: N_2, O_2, C_2, B_2, F_2, CO, NO, and their ions; HCl, BeF_2, CO_2, (idea of s-p mixing and orbital interaction to be given), ionic solids, Born-Haber cycle, covalent bond, coordinate bond, hydrogen bond, dipole moment.

THERMODYNAMICS [07 Hours]

Scope and limitations of Thermodynamics, thermodynamic terms and basic concepts, first law of thermodynamics and its limitations, measurement of ΔE, heat content or enthalpy, heat capacity, relation between Cp and Cv, temperature dependence of ΔH, calculation of thermodynamic quantities.

THE GASEOUS STATE [08 Hours]

States of matter, general characteristics of gases, parameters of a gas, the gas laws, kinetic molecular theory of gases, derivation of kinetic gas equation and derivation of gas laws from it, deviations from ideal behavior and compressibility factor, effects of pressure and temperature on deviations and explanation for the deviations, van der Waals equation of state and its limitations, interpretation of deviations from van der Waals equation, liquefaction of gases-critical phenomenon, van der Waals equation and critical constants, methods of liquefaction of gases.

CHEMICAL KINETICS [06 Hours]

Rate of reactions, factors affecting reaction rates, molecularity of a reaction and order of reaction: zero, first, second and third, with their differential as well as integrated rate laws, characterization and examples, half-lives, methods of determination of order of reactions: integration, fractional change, graphical and isolation.

ORGANIC COMPOUNDS AND REACTIONS [09 Hours]

Structure and properties, relationship between shapes and properties of organic molecules: reactive intermediates, electrophiles and nucleophiles, free radical, carbonium ion and carbanion, carbenes, nitrenes, and arynes, types of organic reactions: stepwise, ionic and free radical mechanisms, single step concerted mechanism, addition, substitution, elimination and rearrangement, method of determining mechanisms (identification of product, isotope effects and determination of reaction intermediates).

[Total Lecture Hours: 42]

LIST OF PRACTICALS

1. Preparation of solution and its standardization (primary and secondary standards).
2. Titration (Acid-Base, Redox).
3. Purification of solid organic compounds using melting points.
4. Chemical kinetics (esterification/pseudo first/second order).

RECOMMENDED/REFERENCE BOOKS:

1. J. D. Lee, Concise Inorganic Chemistry, fourth edition ELBS, 1991.
2. P. Atkins, Paula J. D., Atkin's Physical Chemistry, Oxford (Indian Edition), Oxford University Press, 2012.
3. B. H. Mahan, University Chemistry, eighth edition, Narosa Publishing House, New Delhi, 1998.
4. R. P. Rastogi, R. R. Misra, An Introduction to Chemical Thermodynamcis, fourth edition, Vikas Publishing House Pvt. Ltd., New Delhi, India, 2000.
5. B. R. Puri, L. R. Sharma, Principles of Physical Chemistry, eighth edition, Vishal Publications, New Delhi, 2001.
6. M. B. Smith, Jerry March, March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure, sixth edition, Wiley-Interscience, 2012.
7. H. Maskill (Ed.), The Investigations of Organic Reactions and Their Mechanisms, first edition, Blackwell Publishing Ltd. Oxford, 2006.
8. A. I. Vogel, Elementary Practical Organic Chemistry: Qualitative Organic Analysis, second edition, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, South Asia, 1997.

Chemistry-II		**L**	**T**	**P**	**Credit**
CYCY 113 S2	**Scheme**	3	0	2	04

- **THERMODYNAMICS** (09 Hours)
  Entropy and second law of thermodynamics, spontaneous thermodynamics processes, combined forms of the first and second laws of thermodynamics, criterion for distinguishing between irreversible and a reversible process, entropy changes for an ideal gas, entropy changes during phase changes, entropy changes in chemical reactions, physical significance of entropy, third law of thermodynamics and its conformation, applications and exceptions of third law of thermodynamics, free energy, thermodynamic functions and spontaneity, standard free energy of formation, free energy and equilibrium constants, temperature dependence of equilibria.

- **CATALYSIS** (05 Hours)
  Catalysis and its classification, characteristics of catalytic reactions, promoters and explanation of promotion action, catalytic poisoning and its explanation along with examples, autocatalysis and its examples, negative catalysis and its explanation with examples, activation energy and catalysis. Theories of catalysis: Intermediate compound formation theory and The adsorption theory, Acid-Base catalysis, Enzyme catalysis: examples, mechanism and characteristics.

- **PERIODIC PROPERTIES** (08 Hours)
  Long form of periodic table, effective nuclear charge, shielding, Slater rules, variation of effective nuclear charge in periodic table, atomic radii (van der Waals), ionic and crystal radii, covalent radii, ionization enthalpy and its applications, electron affinity, electronegativity, electronegativity scales. Variation of electronegativity with bond order, partial charge. Sanderson‟s electron density ratio. Introduction to s-block elements.

- **HYDROCARBONS** (10 Hours)
  Structure, preparation and reactions of: alkanes, alkenes and alkynes. Dienes: Nomenclature, classification, methods of formation of butadiene, chemical reactions, conjugated and isolated dienes, resonance stabilization, 1,2- versus 1,4- addition.

- **STEREOCHEMISTRY OF ORGANIC COMPOUNDS** (10 Hours)
  Conformations and configurations of alkanes; molecular chirality, enantiomers, diastereomers, threo- and erythro- diastereomers, meso compounds, resolution of enantiomers, retention and racemization. Relative and absolute configuration, sequence rules, D and L systems of nomenclature and R and S systems of nomenclature. Determination of composition of enantiomers and diastereomers. Geometric isomerism: determination of configuration of geometric isomers E and Z systems of nomenclature, geometric isomers of oximes and alicylic compounds.

[Total Lecture Hours: 42]

LIST OF PRACTICALS

1. Inorganic Qualitative Analysis (Single salt).

RECOMMENDED/REFERENCE BOOKS:
1. B. H. Mahan, University Chemistry, eighth edition, Narosa Publishing House, New Delhi, India, 1998
2. S. Glasstone, Thermodynamics for Chemists, Affiliated East-West Press Pvt. Ltd., New Delhi, India. 2009.
3. B. S. Bahl, G. D. Tuli, A. Bahl, Essential of Physical Chemistry, fourth edition, S. Chand & Company Ltd, New Delhi, India, 2003.
4. J. D. Lee, Concise Inorganic Chemistry, fourth edition, ELBS, 1991.
5. B. E. Douglas, D. H. Mc Daniel, Concepts & Models of Inorganic Chemistry, Oxford, 1970. 6. M. C. Day, J. Selbin, Theoretical Inorganic Chemistry, second edition, ACS Publications, 1962.
6. E. L. Eliel, S. H. Wilen, Stereochemistry of Organic Compounds, first edition, WileyInterscience, 2008.
7. G. Svehla, Qualitative Inorganic Analysis, seventh edition, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, South Asia, 2009.

Branch Specific Courses for Applied Mathematics & Humanities Department

Foundation Course in Mathematics-I		L	T	P	Credit
MAMA 102 S1	Scheme	3	1	0	04

- **SET THEORY** **(7 Hours)**
  Sets, Intervals, Boundedness of sets, Supremum and infimum, Neighborhood, interior points, Open and closed sets, Limits points, Bolzano – Weierstrass Theorem, Countable and uncountable sets, Compact sets and related results. Finite Sets, Countable sets, Schroder –Berstein Theorem and Knaster – Tarski Theorem, Axoim of choice, Zorn's Lemma, Haussdorff's Maximality Principle and Well – Ordering Theorem and their equivalence.

- **RELATIONS AND FUNCTIONS** **(7 Hours)**
  Definitions, Types of relations and related properties, Cartesian product, One to one and onto functions, composite functions, inverse of a function, Binary operations. Function as a special kind of relation from one set to another. Real valued function of the real variable, domain and range of these functions, constant, identity, polynomial, rational, modulus, signum and greatest integer functions with their graphs. Sum, difference, product and quotients of functions.

- **PARTIAL ORDER SET** **(7 Hours)**
  Basic Definitions: Partial Order, least element, greatest element, maximal element, minimal element, upper bound, lower bound, least upper bound, greatest lower bound, total order and totally ordered sets, chain. Hasse Diagrams and Lattices. LUB Property, GLB Property and their equivalence

- **LIMITS AND CONTINUITY OF FUNCTIONS ON R** **(7 Hours)**
  Limit of a function, Theorems on limits, Continuity of functions and properties, Uniform continuous functions and related results. Definitions of derivatives and related results, Increasing and decreasing functions, Darboux's theorem, Rolle's theorem, Mean value theorems of differential calculus and their applications.

- **FUNCTIONS OF BOUNDED VARIATIONS** **(7 Hours)**
  Functions of bounded variations and their properties, Variation function and related results, Jordon theorem, Vector valued functions, Vector valued functions of bounded variation and related results
  .

- **PRINCIPLE OF MATHEMATICAL INDUCTION** **(7 Hours)**
  Process of the proof by induction, motivating the application of the method by looking at natural numbers as the least inductive subset of real numbers. The principle of mathematical induction (weak and strong) and simple applications.

Total Lecture Hours: 42+Tutorial Hours: 14

Books Recommended:
1. W. Rudin: Principles of Mathematical Analysis, 3rdEdition, McGraw Hill, New York 1976.
2. S.C. Malik and Savita Arora: Mathematical Analysis, 2ndEdition, New Age International (P) Limited, New Delhi, 1994.
3. T. Apostol: Mathematical Analysis, 2nd ed., Narosa Publishers, 2002.
4. H. L.Royden: Real Analysis, 3rd Edition, Macmilan Publishing Co. Inc., New York, 4th Ed., 1993.
5. N.S. Gopalakrishnan: University Algebra- New Age International (P) Limited, New Delhi, 2018
6. Joseph.A. Gallian: Contemporary Abstract Algebra, 9th Edition, Cengage Learning, 2016

Foundation Course in Mathematics-II	L	T	P	Credit
MAMA 113 S2	Scheme	3	1	0	04

Group Theory

- **UNIT-I** **(6 Hours)**
  Binary relation, Function, Binary Operation, Groups, Various properties and examples of group, Subgroups, Properties of subgroups, Normal subgroups and important results, Cyclic groups, generator, Properties of Cyclic groups.

- **UNIT-II** **(6 Hours)**
  Cosets, Lagrange's theorem, Euler theorem, Fermat's theorem (with proofs), Isomorphism and homomorphism of groups and their examples and results, Quotient group.

- **UNIT-III** **(6 Hours)**
  First, Second and Third Isomorphism Theorems (with proofs), Direct product of groups and its related results.

- **UNIT-IV** **(6 Hours)**
  Permutations, even and odd permutations, transportation, disjoint cycles, permutation groups and its related results, Cayley's theorem, Cauchy's theorem (with proofs)

Trigonometry

- **UNIT-V** **(10 Hours)**
  Exponential values of sines, cosines and hyperbolic functions. Inverse circular and hyperbolic functions.Logarithm of the complex quantities.

- **UNIT-VI** **(08 Hours)**
  Gregory's series.Summation of series. Infinite product of sine and cosine

(**Total Lecture Hours: 42 + Tutorial Hours: 14**)

Text Book:

1. N.S. Gopalakrishnan: University Algebra- New Age International (P) Limited, New Delhi, 2018
2. Joseph.A. Gallian: Contemporary Abstract Algebra, 9th Edition, Cengage Learning, 2016
3. J.B. Fraleigh: "First Course in Abstract Algebra", A. Third Editon, Narosa Publishing House New Delhi 2003.
4. S. L. Loney: Plan Trignometry-I, Palala Press, 2016
5. S. L. Loney: Plan Trignometry-II, Palala Press, 2016

Branch Specific Courses for Applied Physics Department

Introduction to Classical Mechanics		L	T	P	Credit
PHPH 102 S1	**Scheme**	**3**	**0**	**2**	**04**

- **VECTORS FUNDAMENTALS AND DIFFERENT CO-ORDINATE SYSTEM**   **(08 hours)**
  Unit vectors, Vector operations, Tripple products, Vector algebra in component form, ifferential calculus, Cartesian coordinate system, Spherical coordinate system, Cylindrical coordinate system.

- **NEWTON'S LAWS OF MOTION, CONSERVATION LAWS, MOMENTS OF INERTIA**
     (08 hours)
  Mechanics of the particle, Equation of motion, Different conservation laws, Moments of inertia, Motion in central force field.

- **RIGID BODY MOTION**   **(06 hours)**
  Euler's theorem, Angular momentum and kinetic energy, Euler's quation of motion, Euler's angles.

- **ELASTICITY & HYDRODYNAMICS**   **(08 hours)**
  Stress and Strain, Young's modulus, Shear modulus and Bulk Modulus, Buoyancy, Types of fluid flow, Bernoulli's equations.
  Viscocity, Terminal Velocity.

- **SIMPLE HARMONIC MOTION**   **(04 hours)**
  Restoring force, Elastic potential energy, Period and frequency, Energy, Pendulums, Applications of SHM.

- **OSCILLATIONS**   **(08 hours)**
  Damped oscillations, forced oscillations, coupled oscillations & resonance.

(Total Lecture Hours: 42 Hours)

BOOKS RECOMMENDED:

1. Mathur D. S., Mechanics, S. Chand & Company, 2000.
2. Takwale R. G. & Puranik P.S., Introduction to Classical Mechanics, TMH, 1997.
3. Feymann R. P., Lighton R. B. and Sands M., The Feynman Lectures in Physics Vol. 1, Narosa Publishers, 2008.
4. Verma H. C., Concepts of Physics, Vol. 1 & 2, Bharati Bhavan, 2007.
5. Landau L. D. & Lifshitz E M, Course on Theoretical Physics, Vol. 1: Mechanics, Addison-Wesley, 2002

Kinetic Theory and Thermodynamics		L	T	P	Credit
PHPH 113 S2	**Scheme**	**3**	**1**	**2**	**05**

- **KINETIC THEORY OF GASES** (04 Hours)
  Postulates of kinetic theory of gases, Velocity of gas molecules, Molecular energy, Kinetic-molecular model of an ideal-gas, Kinetic interpretation of temperature, Degree of freedom of gas molecules, Maxwell's law of equipartition of energy.

- **INTERMOLECULAR FORCES & TRANSPORT PHENOMENA** (04 Hours)
  Viscosity of a gas, Thermal conductivity of gases, Van der wall's equation of state, Brownian motion.

- **LAWS OF THERMODYNAMICS** (12 Hours)
  Zeroth law of Thermodynamics, Ist and IInd laws of Thermodynamics, Concepts of temperature, Internal energy and entropy, Calculations of change of internal energy and entropy in various thermodynamic processes.

- **THERMODYNAMIC POTENTIALS, HELMOLTZ & GIBBS FUNCTIONS, MAXWELL RELATIONS** (10 Hours)
  Giibs and Helmholtz energy, Gibbs paradox, Enthalpy, Maxwell's thermodynamic relations.

- **ELEMENTS OF STATISTICAL PHYSICS** (08 Hours)
  Fermi Dirac, Maxwell Boltzmann and Bose Einstein distributions.

- **THERMODYNAMICS OF BLACK BODIES** (04 Hours)
  Black body and characteristics, Radiation principles like Rayleigh Jeans, Weins and Planck's law of black body radiation.

(Total Lecture Hours: 42)

BOOKS RECOMMENDED:

1. Sears F.W. & Salingar, Thermodynamics, Kinetic theory and Statical Thermodynamics, 3rd Ed. Addison-Wesley/Pearson, 1975.
2. Young & Freedman, Sears and Zemansky's University Physics, Pearson Education, Singapore, 2004.
3. Feymann R. P., Leighton R. B. and Sands M., The Feymann Lectures in Physics, Vol. 1 Narosa Publishers, 2008.
4. Zemanasky M. W., Heat and Thermodynamics, (McGraw Hill), 1957
5. Carter A., Classical and Statistical Thermodynamics, Pearson Education, 1999.