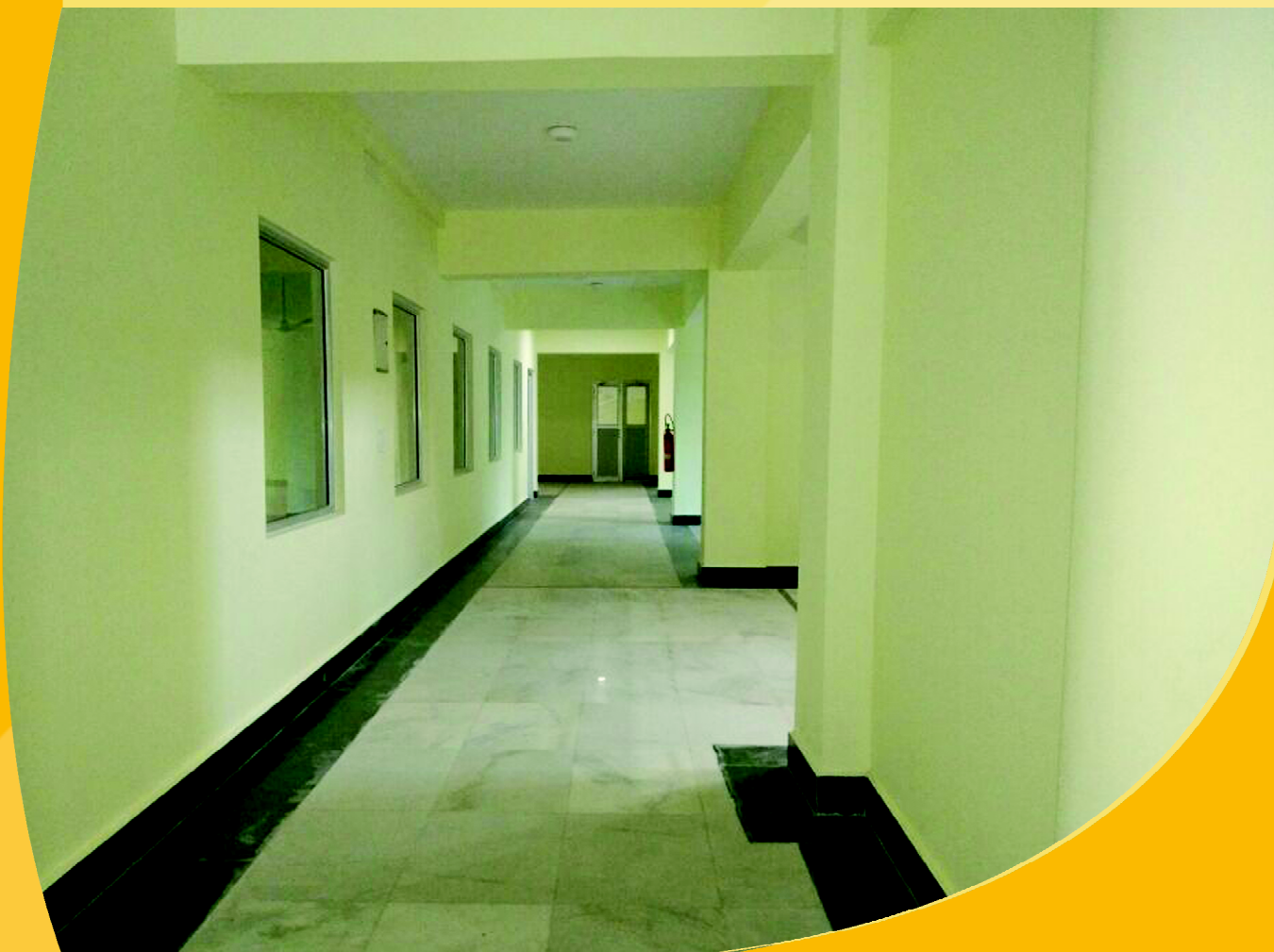# SYLLABI
OF
DIPLOMA MODULE
(Technology)

(Revised and approved by the 24th Academic Council Meeting, held on 6th May, 2017)

NORTH EASTERN REGIONAL INSTITUTE OF SCIENCE & TECHNOLOGY
DEEMED TO BE UNIVERSITY U/S 3 OF THE UGC ACT, 1956
Nirjuli (Itanagar), Arunachal Pradesh - 791 109

REVISED SYLLABUS

FOR

DIPLOMA PROGRAMME

North Eastern Regional Institute of Science and Technology

Deemed to be University

Nirjuli Arunachal Pradesh, 791109

2017

PREFACE

The syllabi of U.G programme has been revised and approved in the 24th Academic Council Meeting,2017.The academic programme of NERIST in Technology stream has been designed to consist of three modules i.e Base(Certificate), Diploma and Degree Modules. In applied Science Stream four years Degree Module is offered.

The syllabi for Base, Diploma and Degree programmes of NERIST are unique and innovative and have been prepared by the faculty of the Institute keeping the requirement of AICTE,UGC and ICFRE guidelines in mind.

The following norms have been followed in presenting the structures and contents.

COURSE CODE:

Courses are denoted by coded comprising two letters and four digits. The letters indicate the Department which is offering the courses. The digit represents the following:

i. The first digit from the left stand for the year.

ii. The second digit **1** or **2** from the left stands for the odd or even semester respectively for the regular courses.

iii. The second digit **3** or **4** from the left stands for theodd or even semester respectively for the bridge courses at the degree level.

iv. The third and the fourth digits from the left is used for course number of which **00** to **49** are of theory or courses with more theory component and **50** to **99** are for practice or courses with more practice components.

Besides the following course codes are specifically reserved:

Y299 - Project.

6266 - Study Tour.

6199 - Industrial Tour.

YS77 - Audit Course.

Y288 - Extra Curricular Activities and discipline grades.

"Y" stands for years and "**S"** for Semester.

COURSE CREDITS:

Lecture/Tutorial: One Hour per week per semester is equivalent to one credit. Extra tutorials, whenever applicable do not carry any credits.

Practice: Two hours per week per semester is equivalent to one credit. If the number of practice hour is an odd number and more than one, then the credits equivalent to the next higher even number of hours will be assigned. For example, 3 hours of practice will carry 2 credits, 5 hours carries 3 credits and so on.

UNITIZATION:

The course has been unitized with the number of units ranging from IV to VI, depending upon the credit of the course, coverage required and the nature of the course. Each unit has been assigned specific number of contact hours, which has been fixed @14 contact hours per lecture credit of the course.

Recommended Books:

Suggestions on the recommended books have been given at the end of each course, which may be supplanted by the Course Coordinator, if required, while offering the Course.

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Department of Agricultural Engineering
Programme: Diploma in Agricultural Engineering

Year I
Semester I

S.N.	Course Code	Course Title		L	T	P	Credits
1	PH3102+	Physics - III B		2	0	2	03
2	CY3101+	Chemistry - III		3	0	2	04
3	HS3101+	Communication Skill		2	0	2	03
4	ME3151*	Comprehensive Workshop - I (AE/ME/CS)		0	0	6	03
5	ME3152*	Mechanical Engineering Drawing		0	0	6	03
6.	ES3101*	Applied Mechanics (EE/AE)		3	1	0	04
7	AE3101	Agricultural Surveying		3	0	2	04
8	ES3100	Object Oriented Programming with C++		2	0	4	04
9	MA3101	Engineering Mathematics - I		3	1	0	04
10	FO3121	Soil Science & Crop Production		3	0	2	04
			Total	18/14	1/2	14/20	26/26

Semester II

S.N.	Course Code	Course Title		L	T	P	Credits
1	PH3202	Physics - IV B		2	0	2	03
2	CY3202	Engineering Chemistry - I A		3	0	2	04
3	MA3201	Engineering Mathematics - II		3	1	0	04
4	AE3201	Engineering Thermodynamics		3	1	0	04
5	AE3202	Strength of Materials		3	1	0	04
6	AE3203	Fluid Mechanics		3	0	2	04
7	ES3200	Environment and Ecology		3	0	0	03
			Total	20	3	6	26

Year II
Semester III

S.N.	Course Code	Course Title		L	T	P	Credits
1	EE4123	Basic Electrical Engineering		3	0	2	04
2	AE4101	IC Engines		3	1	0	04
3	AE4102	Farm Machinery - I		3	0	2	04
4	AE4103	Soil Mechanics		3	0	2	04
5	AE4104	Agricultural Process Engineering - I		3	0	2	04
6	AE4105	Soil and Water Conservation Engineering		3	0	2	04
7	AE4151	Seminar		0	0	2	01
			Total	18	1	12	25

Semester IV

S.N.	Course Code	Course Title		L	T	P	Credits
1	AE4201	Farm Power - I		2	0	2	03
2	AE4202	Agricultural Process Engineering - II		3	1	0	04
3	AE4203	Irrigation and Drainage Engineering - I		3	0	2	04
4	AE4204	Building Construction and Cost Estimation		3	1	0	04
5	AE40**	Elective		3/3/1	1/0/0	0/2/6	04
6	HS4203	Agricultural Economics and Farm Management		3	0	0	03
7	AE4299	Project		0	0	6	03
8	ED4288	Extra Curricular Activities and Discipline		0	0	0	02
			Total	18/18/16	3/2/2	10/12/16	28+ Bridge

for 10+2 Vocational/NERIST Certificate
* Bridge for 10+2 (PCM)

Course Code	List of Electives (Course Title)	L	T	P	Credits
AE4001	Food Science	3	1	0	4
AE4002	Agro Industries	3	1	0	4
AE4003	Seed Technology and Processing	3	1	0	4
AE4004	Aquacultural Engineering	3	1	0	4
AE4005	Tea Science and Technology	3	1	0	4
AE4006	Land Grading and Earth Moving Machinery	3	0	2	4
AE4007	Waste Land Development	3	1	0	4
AE4008	Advanced Fruit and Vegetable Processing	3	1	0	4
AE4009	Convenience Food and Beverage	3	1	0	4
AE4010	Introduction to Computer Aided Design	1	0	6	4
AE4011	Material Science and Engineering	3	1	0	4

COURSE CONTENT

ES3101 Applied Mechanics: 4 Credits (3-1-0)

Unit 1	Introduction to mechanics and unit systems. Equivalent forces at a point, simplest resultants in two and three dimensions, equations of equilibrium, free body diagrams, reactions, indeterminacy and solvability.	8 lectures
Unit 2	Two dimensional frames and trusses: Method of members, joints and sections. Principle of virtual work, friction forces, sliding and rolling friction.	8 lectures
Unit 3	Properties of surfaces, centroids, mass centres, second moment and product of inertia of plane area, parallel axis theorem and polar moment of inertia.	8 lectures
Unit 4	Kinematics: Rectilinear and plane curvilinear motion, co-ordinate system. Kinetics of particles: Newton's second law, equation of motion, work and kinetic energy, potential energy, impulse and momentum	9 lectures
Unit 5	Dynamics of a Rigid Body: D'Alembert's principle, simple harmonic motion. Impact of two bodies: Co-efficient of restitution, plane centre of collision, collision of a small body with massive body; Work, power & energy principles.	9 lectures

Recommended Books:

1 Engineering Mechanics Statics and Dynamic, I.J. Shames, Prentice Hall of India Pvt. Ltd. New Delhi. 4th Ed., 1992.
2 Engineering Mechanics Statics and Dynamics, J.L. Meriam and L.G. Krige, John Wiley and Sons, New York, 1993.
3 Mechanics of Structures, Vol.-1, 15th Ed., S.B. Junnarkar, Charotor Publishing House, Anand, 2000.
4 Engineering Mechanics, K.L. Kumar, Tata McGraw Hill Publishing Co. Ltd., New Delhi. 1986.

AE3101 Agricultural Surveying: 4 Credits (3-0-2)

Unit 1	Measurement of distance; concept of scale; principles and methods of chain surveying	8 lectures
Unit 2	Principles and methods of compass surveying, and plane table surveying	8 lectures
Unit 3	Principles of leveling, drawing contour maps	8 lectures
Unit 4	Theodolite traversing, electronic theodolite, total station, GPS	10 lectures
Unit 5	Measurement of regular and irregular area and volume, estimation of earthwork	8 lectures

Recommended Books:

1. Surveying Vol-I, B.C. Punmia and A.K. Jain, 13th Ed., Laxmi Publication Pvt. Ltd., New Delhi, 1985.
2. Surveying Vol-I, K.R. Arora, 5th Ed., Standard Book House, New Delhi, 1998.
3. Surveying and Levelling, N.N. Basak, Tata McGraw-Hill Publishing Co. Ltd., 2011.
4. Surveying and Levelling- parts-I & II, T.P. Kanetkar and A.B. Kulkarni, GrihaPrakashan, Poona, 1988.

FO 3121 Soil Science and Crop Production 4 Credits (3-1-0)

Unit 1	Definition of soil, Rocks and minerals, Soil formation and Classification, Soil survey methods. land use capability and mapping. Major soil types of India, soil texture, soil temperature and soil air	9 lectures
Unit 2	Soil colloids, cation and anion exchange in soils, soil reactions and buffering capacity. Soil humus and its formation, C:N ratio, Significance of macro and micro nutrients, Soil and water testing, Soil fertility management, Important Ferilizers, Salaine and Alkali soils and their reclamations	9 lectures
Unit 3	Pronciples of tillage. Tilth and its characterstics. Weeds and their control. Fertilization and plant protection	7 lectures
Unit 4	Classification of crop. Cropping systems, mono, double and multiple cropping. Relay cropping and mixed cropping, crop rotation. Concept of dry farming	8 lectures
Unit 5	Cultivation practices of important field crops, improved varities, seed rate, time and method of swoing, maturing. Effect of different weather parameters on crop growth and development.	9 lectures

Recommended Books

1. Cropping systems in the tropics - Principles and Management, S. P. Palaniappan (1996, Revised 2008), New Age International
2. Principles of Crop Production : Theory, Techniques and Technology, A. George (2002), Prentice- hall of India Pvt. Ltd.
3. Nature and Properties of Soil N. C. Brady (1990 Revised) : Mac Millan

AE3201 Engineering Thermodynamics: 4 Credits (3-1-0)

Unit 1	Thermodynamic systems, surroundings, thermodynamic properties, processes and cycles, thermodynamic equilibrium, path and point function. Zeroth law of thermodynamics and measurement of temperature. Work in various quasi-static processes. Heat transfer.	6 lectures
Unit 2	First law of thermodynamics: Open system and closed system, application to flow processes. Internal energy and enthalpy. Limitations of first law of thermodynamics.	7 lectures
Unit 3	Heat engine, refrigerator and heat pump. Classical statements of second law of thermodynamics. Reversibility and irreversibility. Carnot cycle. Reversible heat engine. Entropy: Concept, t-s diagrams, principles and applications.	12 lectures
Unit 4	Properties of pure substances and mixtures: Phase change of pure substances, p-v, p-t, p-v-t, t-s and Mollier diagram of pure substances. Equation of state, gas laws, Dalton's law of partial pressure, entropy of gas mixtures.	10 lectures
Unit 5	Thermodynamic cycles: Steam power cycle, Otto, Diesel and dual cycle.	7 lectures

Recommended Books:

1 Engineering Thermodynamics, P.K. Nag, 2nd Ed., Tata McGraw Hill Pub. Co. Ltd. New Delhi, 1985.

2 Heat and Thermodynamics, M.W. Zimnanskyand R.H. Dittman, International Edition, McGraw Hill Book Co., Auckland, 2000.

3 Introduction to Thermodynamics, Y.V.C. Rao, Wiley Eastern Ltd., New York, 1993.

4 Fundamentals of Classical Thermodynamics, G.J. Van Wyten, R.E. Sonntag andC. Borgnakke, 2nd Ed., Wiley Eastern Ltd., New York, 1998.

AE3202 Strength of Materials: 4 Credits (3-1-0)

Unit 1	Introduction to Strength of Materials: Stress, strain, Hooke's law, relationship of elastic constants, concept of shear stress, stress-strain relationship, Poisson's ratio, stress-strain diagrams for uniaxial loading	.8 lectures
Unit 2	Deformation of axially loaded members and statically indeterminate problems, torsion of circular shafts, strength of shaft, stress and deflections in closed coiled helical springs subjected to axial forces	.9 lectures
Unit 3	Reactions for statically determinate beams, relationships between load, shearing force and bending moment, shear force and bending moment diagrams	.7 lectures
Unit 4	Theory of simple bending and shearing stresses in beams. Members subjected to combined loads, principal stresses and principal planes, principal strains, Mohr's circle of stresses and strain.	9 lectures
Unit 5	Beam deflections: Calculation of deflection for different types of beams under different loading conditions, double integration method and area moment method.	9 lectures

Recommended Books:

1 Strength of Materials, F. L. Singer and A. Pytel, Harper & Row Publisher, New York, 1980.

2 Strength of Materials and Mechanics of Structures, Vol. I & II, B.C. Punmia, Standard Publishers & Distributors, Delhi, 1988.

3 Mechanics of Structures, Vol. I & II, 15th Ed., S.B. Junnarkar, Charotar Publishing House, Anand, 2000.

4 Mechanics of Materials, J.M. Gera and S. P. Timoshenko, 2nd Ed., CBS Publishers & Distributors, Delhi, 1980.

AE3203 Fluid Mechanics: 4 Credits (3-0-2)

Unit 1	Definition and properties of fluids, units of measurement, fluid statics, pressure at a point and its measurement, fluid static forces on submerged surfaces, buoyancy, condition of flotation	12 lectures

	and stability of submerged and floating bodies.	
Unit 2	Kinematics of fluids, Lagrangian and Eulerian description of fluid motion, stream lines, path lines, streak lines, types of fluid flow: Translation, rotation, circulation and vorticity,stream function, velocity potential and flow net.	6 lectures
Unit 3	Dynamics of fluid: transport theorem, conservation laws, equations of continuity, Euler's equation of motion, Bernoulli's equation, viscous flow.	8 lectures
Unit 4	Internal flow: laminar and turbulent flow in pipes, general equations for head loss Darcy-Weisbach and Fanning's equation	8 lectures
Unit 5	Dimensional analysis and similitude: Raleigh's method and Buckingham pi theorem, types of similarities, dimensional analysis, dimensionless numbers	8 lectures

Recommended Books:

1 Fluid Mechanics, V.L. Streeter and E.B. Wylie, McGraw Hill Book Co., Singapore, 1983.

2 Hydraulics and Fluid Mechanics, P.N. Modi and S.M. Seth, Standard Book House, Delhi, 1999.

3 Fluid Mechanics & Hydraulic Machines, R.K. Bansal, Laxmi Publication Pvt. Ltd., New Delhi, 2000.

4 A Text Book of Hydraulics, Fluid Mechanics and Hydraulic Machines, R.S. Khurmi, S. Chand and Company, New Delhi, 2000.

5 Fluid Mechanics including hydraulic machines, A.K. Gupta, Khanna publishers, 2006.

AE4101 Internal Combustion Engine:4 Credits (3-1-0)

Unit 1	IC Engine: Basic classification, components, material of construction and their working principle. CI and SI engines and their fundamental differences	.5 lectures
Unit 2	Working principle of 2-stroke and 4-stroke engines. Valve timing, ignition timing, and firing order. Power efficiencies and their measurements.	6 lectures
Unit 3	Fuel and combustion: Important qualities of CI and SI engine fuels, and their rating. Combustion in CI and SI engines.Fuel system of CI and SI engines.	10 lectures
Unit 4	Ignition system: Battery ignition system, magneto ignition system, spark plug. Intake and exhaust systems: types of air cleaner, mufflers, super chargers and turbo chargers. Diesel exhaust treatment systems like DPF, DOC and catalytic converter.	10 lectures
Unit 5	Cooling system: Purpose and types of cooling, heat transfer during cooling, coolant and antifreeze, cooling system maintenance. Lubrication system: Theory of lubrication, types and properties of lubricant, types of lubrication system and their maintenance.	11 lectures

Recommended Books:

1 Fundamental of Internal Combustion Engine, P.W. Gill, J.H. Smith and E.J. Ziurys, 1stEd., Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1954.

2 A course in Internal combustion Engine, M.L.Mathur and R. P. Sharma, 7th Ed., Dhanpat Rai and Sons, Delhi, 1994.

3 Engine and Tractor Power, Carroll E. Goering and Alan C. Hansen, American Society of Agricultural Engineers. Michigan, 2004.

AE4102 Farm Machinery - I: 4 Credits (3-0-2)

Unit 1	Scope, need and constraints of mechanization. Types of implements: Mounted, semi mounted, trailed and self-propelled. Implement performance parameters: Field capacity, field efficiency.	7 lectures
Unit 2	Tillage implements:Tillage methods, Mould board plough, disc plough,chisel plough, subsoiler, cultivator, harrows, rotary plough, lister, ridger, puddler andleveller.	9 lectures
Unit 3	Sowing and planting equipment: Methods of sowing, functions, types of furrow opener and metering mechanism. Precision planting. Seed drill and planter: Power transmission system and calibration. No-till drill, strip-till drill and transplanter.	8 lectures

| Unit 4 | Plant protection equipment: Principles of atomization, drip and drift, types of sprayers and their various components.Types of dusters. Interculture equipment: Manual and power operated. | 8lectures |
| Unit 5 | Harvesting equipment: Principles of cutting.Shear type harvesting devices: Mower, reaper, binder, windrower, and their adjustment. Threshing equipment: Principles of threshing, various types of threshers, and types of threshing cylinders. Thresher performance analysis. | 10 lectures |

Recommended Books:

1 Principles of Farm Machinery, R.A. Kepner, Roy Bainer and E.L. Berger, 1stEd., CBS Publishers and Distributors, New Delhi, 1987.

2 Engineering Principles of Agricultural Machines, A.K. Srivastava, C.E. Goering and R.P.Rohrbach, 2nd Ed., American Society of Agricultural Engineers, Michigan, 2005.

3 Farm Machinery and Equipment, 6th Ed., H.P. Smith and L.H. Wilkis, Tata McGraw Hill Publishing Co. Ltd. New Delhi, 1988.

4 Principles of Agricultural Engineering, Vol.-I, A.M. Michael and T.P. Ojha, 3rdEd., Jain brothers, New Delhi, 1978.

AE4103 Soil Mechanics: 4 Credits (3-0-2)

Unit 1	Preliminary definitions and relationships, three phase system of soil, determination of index properties, classification of soils.	12 lectures
Unit 2	Soil water: Analysis of effective and neutral pressures under different hydraulic pressures at different points below the soil.	6 lectures
Unit 3	Darcy's law, determination of permeability by laboratory and field methods, horizontal and vertical hydraulic conductivity and seepage analysis using flownet.	6 lectures
Unit 4	Stress distribution under point, line and circular load condition, compaction, consolidation and shear strength analysis using Mohr circle.	10 lectures
Unit 5	Analysis of active and passive earth pressures on retaining wall, Rankine's theorem of earth pressure and bearing capacity of soils.	8 lectures

Recommended Books:

1 Soil Mechanics SI Version, T.W. Lambe and R.V. Whitman, Wiley Eastern Ltd., New Delhi, 1979.

2 Principles of Soil Mechanics and Foundation Engineering, V.N.S. Murthy,UBSPD, New Delhi, 2001.

3 Soil Mechanics and Foundations, B.C. Punia, Ashok Kumar Jain and Arun Kumar Jain, 13th Ed., Laxmi Publications Pvt. Ltd., New Delhi, 1994.

4 Soil Engineering in Theory and Practice, Part-I, A. Singh and G.R. Chowdhury, CBS Publishers and Distributors, Delhi, 1994.

AE4104 Agricultural Process Engineering - I: 4 Credits (3-0-2)

Unit 1	Importance of engineering properties of biological materials in design and operations of machines and equipment's involved in food processing and development of products; Physical properties: shape, size, gravity; Aero and hydrodynamic properties; Frictional properties; Thermal properties.	10 lectures
Unit 2	Mechanical and Rheological properties of food materials: Flow behaviour of granular; powdered and liquid food materials. Classification of foods based on flow and deformation characteristics; rheological model. Textural profile analysis of food products.	10 lectures
Unit 3	Handling of agricultural materials: Conveyors, elevators. Pneumatic conveying.	6 lectures
Unit 4	Cleaning, sorting and grading operations; Screening: effectiveness of screening; Machineries for cleaning, sorting & grading; Cyclone separators; Fans & Blowers.	10 lectures
Unit 5	Size reduction: Principles, methods & equipment.	6 lectures

Recommended Books :

1   Fundamentals of Food Process Engineering, R.T. Toledo, 2nd Ed., CBS Publishers and Distributors, New Delhi, 1997.

2   Unit Operations of Chemical Engineering, W. McCabe, J. Smith and P. Harriot, 5th Ed., McGraw Hill Book Co., New York, 1993.

3   Transport Processes and Unit Operations, C.J. Geankopolis, 3rd Ed., Prentice Hall of India, New Delhi, 1999.

4   Food Engineering Operations, J.G. Brennan, Butters Cowell and Lilley, 3rd Ed., Elsevier Applied Science, Amsterdam, 1990.

5   Engineering Properties of Foods, M. A. Rao, Syed S.H.Rizvi and Ashim K. Datta,4th Ed., CRC Press, Florida,2014.

6   Unit Operations of Agricultural Processing, K.M. Sahayand K.K. Singh, 3rd Ed.,Vikas Publishing House, New Delhi, 2003.

AE4105 Soil and Water Conservation Engineering: 4 credits (3-0-2)

Unit 1	Hydrologic cycle, precipitation, infiltration, evaporation, runoff .	10 lectures
Unit 2	Land use capability classification, types and estimation of water and wind erosions.	8 lectures
Unit 3	Conservation measures for hill slopes, agricultural lands, gullies; vegetative waterways and their design; stream bank erosion and its control.	12 lectures
Unit 4	Water harvesting and farm ponds, rate of sedimentation and loss of storage.	8 lectures
Unit 5	Introduction to watershed management.	4 lectures

Recommended Books:

1 Soil and Water Conservation Engineering, G.O. Schwab, R.K. Frevert, T.W. Edminster and K.K. Barnes, 3rd Ed., John Wiley and Sons, New York, 1981.

2 Land and Water Management Engineering. V.V.N. Murthy, 2nd Ed., Kalyani Publishers, Ludhiana, 1985.

3 Introductory Soil and Water Conservation Engineering. B.C. Mal, Kalyani Publishers, Ludhiana, 1995.

4 Soil Conservation, Norman Hudson, B.T. Batsford, London, 1981.

5 Soil and Water Conservation Engineering, R.Suresh, 2nd Ed., Standard Publishers Distributors, Delhi, 1997.

6 Hydrology and Soil Conservation Engineering, Ghanshyam Das, Prentice Hall of India Pvt.Ltd. New Delhi, 2000.

AE4201 Farm Power - I: 3 Credits (2-0-2)

Unit 1	Various sources of farm power: Mechanical, electrical and renewable sources.Status of farm power in India. Types of off road vehicles. Trends in tractor design.	3 lectures
Unit 2	Engine features: Combustion chamber, engine balancing, and flywheel. Engine performance characteristics: Torque, power and fuel consumption.	7 lectures
Unit 3	Power transmission system of tractor: Clutch, gearbox, differential, final drive, PTO and brake.	7 lectures
Unit 4	Tractor steering system: Ackermann steering geometry, components and their adjustments . . Electrical and electronic system: Alternator, starter motor, battery and wiring harness	6 lectures
Unit 5	Power tiller: Clutch, transmission gear, steering and brake.Tractor, power tiller and implement cost estimation, break even analysis.	5 lectures

Recommended Books:

1 Tractor andtheir Power Units, John B. Liljedahl, W.M. Carleton, P.K. TurnquistandH. Makotohoki, 4thEd., CBS Publishers & Distributors, New Delhi, 1977.

2 Off-Road Vehicle Engineering Principles, Carroll E.Goering, Marvin L. Stone, David W. Smith and Paul K. Turnquist, American Society of Agricultural Engineers. St. Joseph, Michigan, 2003.

3 Engine and Tractor Power, Goering, Carroll E. and Alan C. Hansen, American Society of Agricultural Engineers. St. Joseph, Michigan, 2004.

AE4202 Agricultural Process Engineering - II: 4 Credits (3-1-0)

Unit 1	Concept of water activity; types of moisture; Moisture measurements of grain; Equilibrium moisture content and models.	8 lectures
Unit 2	Drying utilities of agricultural produce: Psychrometric, theory of grain drying, drying methods, different types of grain dryers; Dryer performance; Solar dryers.	10 lectures
Unit 3	Milling of cereals, pulses & oilseeds: Milling of wheat, paddy and pulses; Parboiling of paddy; Processing of oilseed, oil extraction methods.	10 lectures
Unit 4	Storage of agricultural produce: physiology of food grain during storage; problems of grain storage and their measures; Moisture migration; source of infestation.	7 lectures
Unit 5	Grain storage structure; Different types of improved storage structures; Aeration and fumigation; Storage of agricultural perishables.	7 lectures

Recommended Books :

1 Agricultural Process Engineering, S.M. Henderson & R.L. Perry, 3rd Ed., John Willey & Sons, New York, 1976.

2 Unit Operations of Agricultural Processing, K.M. Sahayand K.K. Singh, 2nd Ed., Vikas Publishing House, New Delhi, 2001.

3 Post Harvest Technology of Cereals, Pulses and Oil seeds, A. Chakraborty, 3rd Ed., Oxford & IBH Publishing Co.Pvt. Ltd., New Delhi,2000.

4 Drying and Storage of Cereal Grains, B.K. Bala, Oxford & IBH Publishing Co.Pvt. Ltd., New Delhi, 2000.

5 Drying and Storage of Agricultural Crops, C.W. Hall, The AVI Publishing Company Inc., Connecticut, 1980.

AE4203 Irrigation and Drainage Engineering - I: 4 Credits (3-0-2)

Unit 1	Sources of irrigation water, measurement of irrigation water, water lifts and irrigation pumps.	10 lectures
Unit 2	Soil-plant-water relationships, crop water requirement, irrigation efficiencies, irrigation scheduling.	10 lectures
Unit 3	Land grading and field layout for efficient irrigation systems; water conveyance and its control.	6 lectures
Unit 4	Introductory concept of farm irrigation methods: border, check basin, furrow, sprinkler and drip.	10 lectures
Unit 5	Drainage: importance and problems, drainage co-efficient, types of surface and subsurface drainage systems.	6 lectures

Recommended Books:

1 Irrigation Theory and Practice, A.M. Michael, 2nd Ed.,Vikas Publishing House, New Delhi, 2008.

2 Fundamentals of Irrigation Engineering, Bharat Singh, 8th Ed., New Chand and Brothers, Roorkee, 1997.

3 Drainage Engineering, J.N. Luthin, John Wiley and Sons, New York, 1970.

4 Irrigation Engineering, G.S. Birdie, and R.C. Das,2nd Ed., DhanpatRai and Sons, New Delhi, 1996.

AE4204 Building Construction and Cost Estimation: 4 Credits (3-1-0)

Unit 1	Properties and classification of building materials like bricks, lime, cement, sand, coarse aggregates, timber, asbestos, glass etc.	7 lectures
Unit 2	Constructional elements such as brick, stone work, mortar, concrete, plastering, painting, ceiling, roofing etc.	7 lectures
Unit 3	Design of beams, columns and column footings, roof slabs, roof trusses etc.	15 lectures
Unit 4	Concept of detailed and abstract estimates, introduction to departmental schedules, estimation procedure for building, sheds and roads.	6 lectures
Unit 5	Factors affecting building costs, cost evaluation of design and planning alternatives for building and estate development, measurement and pricing, economic methods for evaluating investments in buildings and building systems: Cost-in-use, benefit-to-costs and savings-to-investment ratios, rate of return, net benefits, payback.	7 lectures

Recommended Books:

1 Farm Structures, H.J. Barre and L.L. Sammet, John Wiley and Sons Pvt. Ltd., New York,1950.
2 Farm Service Buildings, H.E. Gray, McGraw Hill Book Co., New York,1955.
3 Farm Buildings in Punjab, A.P. Bhatnagar,1stEd.,PAU Ludhiana, 1976.
4 Planning Farm Buildings, John C. Wooley, McGraw Hill Co., New York,1953.
5 Estimating and Costing,B.N. Dutta, UBS publishers, 2000.

AE4001 Food Science: 4 Credits (3-1-0)

Unit 1	Food quality characteristics, chemical compositions and physical structures of food, composition and nutritive value of common foods.	10 lectures
Unit 2	Structure, properties, metabolic functions of food constituents: water, carbohydrates, liquids, proteins, enzymes, vitamins and minerals, pigments and colours, flavours. Food additives.	11 lectures
Unit 3	Undesirable constituents in food, changes in food constituents during processing and storage, food spoilage.	6 lectures
Unit 4	Microbial groupings and identification, nutrient requirements for bacterial culture, growth and inactivation kinetics, harmful and beneficial effects of microbes, microbial production of alcohol and organic acids. Food poisoning.	10 lectures
Unit 5	Food laws, standards and safety.	5 lectures

Recommended Books :

1 Food Chemistry, O.R. Fennema, 2nd Ed., Marcel Dekker Inc., New York, 1985
2 The Science of Food, Marion Bennion, John Wiley and Sons, New York, 1980.
3 Food Chemistry, L.H. Meyer, CBS Publisher and Distributors, New Delhi, 1960.
4 Food Microbiology, W.C. Frazier and D.C. Westhoff, Tata McGraw Hill Publishing Co. Ltd. New Delhi, 1981.

AE4002 Agro-Industries: 4 Credits (3-1-0)

Unit 1	Introductory studies - Market survey, selection of Agro industries.	6 lectures
Unit 2	Technical and financial aspects of rice mill, parboiling unit, oil mill, flour mill cattle feed mill.	12 lectures
Unit 3	Technical and financial aspects of spices grinding unit, fruit and vegetables processing unit, implement manufacturing unit, seed processing unit.	12 lectures
Unit 4	Financial support system - facilities and incentives by Government and other financial institutions.	12 lectures

Recommended Books :

1 Hand Book of Processing and Utilization in Agriculture, I. A. Wolff, CRC Press Inc., Boca Roton, Florida, 1982.

AE4003 Seed Technology and Processing: 4 Credits (3-1-0)

Unit 1	Chemistry of seeds, seed germination, seed viability, seed dormancy, seed and seedling vigor.	10 lectures
Unit 2	Seed production, processing and handling; seed drying.	10 lectures
Unit 3	Seed testing, certification and marketing	.8 lectures
Unit 4	Seed legislation and law enforcement.	7 lectures
Unit 5	Seed Industry in India and Their Role in Agricultural Development: National seeds corporation: State seeds, Development corporation: Five year plans, Private seed industries.	7 lectures

Recommended Books :

1 Principles of Seed Science and Technology, L.O. Copeland, Surjeet Publications, Delhi, 1988.
2 Seed Processing, B.R.Gregg, A.G., Law, S.S. Virdi, and J.S.Balis, National Seed Corporation, New Delhi.
3 Seed Certification Manual, J.E. Douglas, National Seeds Corporation, New Delhi.
4 BeejSansadhan (Hindi), R.P. Saxena, Directorate, Translation and Publication, G.B. Pant University Pantnagar, 1984.

AE4004 Aquacultural Engineering: 4 Credits (3-1-0)

Unit 1	Types of culture practices and requirements for culturable species, selection of sites for aquacultural farm, hydrometeorological, environmental and engineering problems.	11 lectures
Unit 2	Micro-level survey for planning and design, assessibilities, socio-economics conditions, water supply and quality, soil quality, available area, topography, vegetations.	10 lectures
Unit 3	Components of a fish farm: Transition, rearing ponds, layout of pond system. Design of dykes of fish farm. Water management system: design of sluices, gates and canals for tide-fed and pump-fed farms, low level and high level reservoirs for pump-fed farm.	11 lectures
Unit 4	Aquacultural equipment: pumps, aerators, feeders, blowers and filters.	10 lectures

Recommended Books :

1 Aquacultural Engineering, F.W. Wheaton, John Wiley & Sons, New York, 1977.

2 Costal Aquacultural Engineering, A.N. Bose, S.N. Ghosh, C.T. Yang and A. Mitra, Edward Arnold, London, 1991.

3 Text Book of Fish Culture, Breeding and cultivation of Fish, M. Huet, Fishing News Book Ltd., 1986.

AE4005 Tea Science and Technology: 4 Credits (3-1-0)

Unit 1	Tea production: Soil and climate, plant propagation and nursery management, planting.	8 lectures
Unit 2	Fertilizer application, irrigation and drainage, plant protection.	10 lectures
Unit 3	Tipping, plucking, shifting and pruning.	8 lectures
Unit 4	Tea processing: Chemistry of tea processing and manufacturing, working principles of processing equipment and their maintenance.	12 lectures
Unit 5	Transport and marketing, warehousing, testing and sale.	4 lectures

Recommended Books :

1 Science and Practice in Tea Culture, D.N.Barua, 1st Ed., Tea Research Association, Jorhat, 1989.

2 Tea in India, BalaSubramanium, 1st Ed., Wiley Eastern Ltd., New Delhi, 1995.

3 Tea Culture, Processing and Marketing, M.J. Mulky and V.S. Sharma, 1st Ed., Oxford and IBH Publishing Co. Pvt. Ltd.,New Delhi, 1993.

4 Tea Production and Processing, Barundeb Banerjee, 1st Ed., Oxford and IBH Publishing Co. Pvt Ltd., New Delhi,1996.

AE4006 Land Grading and Earth Moving Machinery: 4 Credits (3-0-2)

Unit 1	Types of earth moving machinery. Hydraulic system: Components like pumps, valves, and cylinders. Repair and maintenance of hydraulic system.	9 lectures
Unit 2	Crawler tractor: Differential, brake, clutch, suspension, track-assembly, and their repair and maintenance.	9 lectures
Unit 3	Principles of operation of bulldozer, front end loader, excavator, power shovels and their applications in agricultural operations. Boring machines and different methods of boring.	9 lectures
Unit 4	Principles of operation of ditchers, scrapers, leveller, roller, grader, dump truck andload hoisting equipment and their applications in agricultural operations.	9 lectures
Unit 5	Troubleshooting, repair, maintenance, cost of operation, and management of earth moving machines.	6 lectures

Recommended Books:

1 Land Reclamation Machinery, T. Borshchow, R. Mansurou and V. Sergeev, 1st Ed., MIR Publication, Moscow, 1988.

2 Manual of Tractor, J. Konrod, Asia Publishing House, Delhi.

3 Motor Grader, E.G. Roninson, MIR Publication, Moscow, 1985.

AE4007 Waste Land Development: 4 Credits (3-1-0)

Unit 1	Waste lands: Definition and classification.	6 lectures
Unit 2	Degraded soils: Saline and sodic soils, acid soils, eroded soils; quality of water; erosion.	10 lectures
Unit 3	Waste land development: Agronomic, aquacultural, engineering, forest management practices.	12 lectures
Unit 4	Rehabilitation of degraded pasture; sand dunes and their stabilization; management of saline and sodic soils; shifting cultivation and land degradation; rehabilitation of ravine lands.	10 lectures
Unit 5	Irrigation water: Quality and standards; utilization of saline water in agriculture.	4 lectures

Recommended Books:

1 Technology for Waste Land Development, I.P. Abrol and V.V. DhruvaNaryana, 1st Ed., ICAR Publication, New Delhi, 1990.

2 Technology of Waste Lands Development, Ram Prasad, 1st Ed., Associated Publishing Co., New Delhi, 1988.

3 Waste Land Management in India, Anil Kumar and R.N. Pandey, 1st Ed., Ashish Publishing House, New Delhi, 1989.

AE4008 Advanced Fruits and Vegetables Processing: 4 Credits (3-1-0)

Unit 1	Production and processing scenario of Fruits and vegetables in India and world-scope of fruits and vegetables processing industry in India - present status, constraints and prospective.	8 lectures
Unit 2	Fruits and vegetables: Physical properties and composition. Preparation for processing: washing, sorting grading, peeling, slicing and pretreatment.	10 lectures
Unit 3	Fruits and vegetables processing and preservation: Precooling, blanching, freezing, drying and canning	8 lectures
Unit 4	Fruits and vegetables products: Juices, squash, concentrates, jams, jellies, fruit bars, candies, turesjuice powder, chutneys, pickles. Quality control in fruits & vegetables processing.	10 lec
Unit 5	Packaging and transportation for fruit and vegetable: Different types of packaging material for processed products	6 lectures

Recommended Books:

1 Commercial Fruits processing, J.G. Woodroof and B.S. Luh, The AVI Publishing Company Inc., Connecticut, 1988.

2 Commercial Vegetable Processing, B.S.Luh and J.G. Woodroof,The AVI Publishing Company Inc., Connecticut, 1986.

3 Handling Transportation,Storage of fruits and vegetables.A.L.Ryall,and W.J.Lipton, 2nd Ed., The AVI Publishing Company Inc., Connecticut, 1972.

4 Preservation of Fruits and Vegetables, GiridhariLal, G.S. Siddappa and G.L. Tanden, Latest edition, ICAR Publications, New Delhi,1998.

5 Preservation of Fruits and Vegetables products, R.P. Srivastava, Bishen Singh and Mahendra Pal Singh, Dehradun, 1982.

6 Commercial Vegetable Processing, Bor S. Luh and Jasper G.Woodroof, TheAVI, Publishing Co. Inc., Connecticut, 1988.

AE4009 Convenience Foods and Beverages: 4 Credits (3-1-0)

Unit 1	Importance of convenience foods and their types and historical development. Production and Processing: Production and processing of easy to cook food like macaroni, noddles and vermicelli, breakfast and to ready to eat (RTE) cereals, puffed rice, flaked rice, shredded, granular and sugar coated cereals and pulses.	10 lectures
Unit 2	Condiments and Confections: Formulation, processing, packaging and storage of health, infant energy and baby foods, and other speciality and fast foods.	10 lectures

Unit 3	Structure and Texture Protein Foods: Production and storage of extruded ready to eat foods	8 lectures
Unit 4	Production of Alcoholic and Non-Alcoholic Beverages: Production and processing of beer, wine, alcohol, whisky, coffee, tea soft drinks, fruit beverages, sherbets. Biochemical changes and nutritional qualities.	8 lectures
Unit 5	Food laws and Standards (BIS). Food demand and supply. food requirements-factors affecting food demands - present market segments of food process industry in India.	6 lectures

Recommended Books:

1 Food Products Formulary, Vol.-I: Meats, Poultry, Fish, Shellfish, Stephan L. Komarik, Donald K. Tressler and Lucy Long, The AVI Publishing Company Inc., Connecticut, 1975.

2 Cereal Science, S. A.Matz, , J. A.Shellenberger, A.D. Dickson, H.L. Shands, N.W. Kramer and H.M.Beachell, The AVI Publishing Company Inc., Connecticut, 1970.

AE4010 Introduction to Computer Aided Design: 4 Credits (1-0-6)

Unit 1	Introduction to AutoCAD: Screen components, invoking commands, dialog boxes, saving, closing and managing workspaces.	3 lectures
Unit 2	Coordinate systems, object selection methods, setting units type and precision.	2 lectures
Unit 3	Drawing different two dimensional objects like lines, arcs, rectangle, ellipse, regular polygon, polylines. Hatching patterns, editing sketched objects.	3 lectures
Unit 4	Creating text and tables: Annotative objects, creating and editing text, inserting table in the drawing.	3 lectures
Unit 5	Dimension: Fundamental dimensioning terms, creating linear, angular, inspection and associative dimensions. Geometric dimensioning and tolerance: Characteristics and symbols used.	3 lectures

Recommended Books:

1 Mastering AutoCAD 2016 and AutoCAD LT, Brian C. Benton and George Omura, Autodesk Official Press, 2016.

2 Engineering Drawing and Graphics Using AutoCAD, T. Jeyapoovan, 3rd Ed.,Vikas PublishingHouse Pvt.Ltd., New Delhi, 2010.

AE4011 Material Science and Engineering: 4 Credits (3-1-0)

Unit 1	Classification of engineering materials. Geometry of crystal: Space lattice, Space lattice and crystal structures. Determination of Crystal structure. Metallic bonding.	7 lectures
Unit 2	Crystal imperfections and dislocations. Phase diagram and phase transformation. Fracture: Ductile and brittle fracture.	10 lectures
Unit 3	Stress and strain in materials. plastic deformation; creep and mechanism of creep; elastic, anelatsic and viscoelastic behavior; Oxidation and corrosion	11 lectures
Unit 4	Mechanical property tests for materials: Destructive and non-destructive tests, tensile and compression tests, shear test, fatigue test, hardness test, impact test.	8 lectures
Unit 5	Nonmetallic materials: Polymer, fibre, composite material, and ceramic materials; their types, properties, additives, and applications.	6 lectures

Recommended Books:

1 Material Science and Engineering - A first Course, V.Raghavan, 6thEd.,PHI Learning Pvt. Ltd. Delhi, 2015.

2 Introduction to Engineering Materials, B.K. Agrawal, Tata McGraw-Hill Education, Delhi, 1988.

3 Engineering Materials and Metallurgy, R.K. Rajput, 1st Ed.,S. Chand & Co. Ltd., New Delhi,2006.

Department of Civil Engineering
Programme: Diploma in Civil Engineering

Year I

Semester I

S.N.	Course Code		Course Title	L	T	P	Credit
1	PH	3102+	Physics – III-B	2	0	2	3
2	CY	3101+	Chemistry - III	3	0	2	4
3	HS	3101+	Communication Skills	2	0	2	3
4	MA	3101	Engineering Mathematics - I	3	1	0	4
5	ES	3100	Object Oriented Programming with C++	2	0	4	4
6	CE	3101	Fluid Mechanics-I	3	0	2	4
7	CE	3102	Engineering Mechanics	3	1	0	4
8	ME	3153*	Comprehensive Workshop-II	0	0	4	2
9	CE	3103*	Surveying - I	2	0	2	3
10	CE	3104*	Principles of Civil Engineering	3	0	0	3
11	CE	3151*	Engineering Graphics	0	0	4	2
							26

+ Bridge for 10+2 Vocational / NERIST Certificate
* Bridge for 10+2 PCM.

Semester II

S.N.	Course Code		Course Title	L	T	P	Credit
1	ES	3200	Environment and Ecology	3	0	0	3
2	PH	3202	Physics IV-B	2	0	2	3
3	CY	3202	Engineering Chemistry –IA	3	0	2	4
4	MA	3201	Engineering Mathematics - II	3	1	0	4
5	CE	3201	Mechanics of Solids	3	1	2	5
6	CE	3202	Surveying - II	3	0	2	4
							23

Year II

Semester I

S.N.	Course Code		Course Title	L	T	P	Credit
1	HS	4101	Principles of Economics	3	0	0	3
2	CE	4101	Structural Analysis - I	3	1	2	5
3	CE	4102	Water Resources Engineering - I	3	0	2	4
4	CE	4103	Geotechnical Engineering - I	3	0	2	4
4	CE	4104	Environmental Engineering - I	3	0	2	4
5	CE	4105	Concrete Technology	3	0	2	4
6	ME	4121	Principles of Mechanical Engineering	3	1	0	4
							28

Semester II

S.N.	Course Code		Course Title	L	T	P	Credit
1	CE	4201	Design of RCC Structures - I	3	1	0	4
2	CE	4202	Design of Steel Structures - I	3	1	0	4
3	CE	4203	Transportation Engineering - I	3	0	2	4
4	CE	4204	Building Planning and Drawing	2	0	4	4
5	CE	4205	Construction Management and Accounts	2	0	0	2
6	CE	40**	Elective	3	1	0	4
7	CE	4299	Project	0	0	6	3
8	ED	4288	Extra Curricular Activities and Discipline	0	0	0	2
							25+2

Courses offered by the Civil Engineering Department to other Departments

Module	Course Code	Course Title	Contact Hours (L-T-P:Cr)	Offered to the Students of
Diploma	CE 3103	Surveying - I	2 0 2 3	CE(L) and FO (To be run simultaneously with CE 2103 for Base(CE) Students)
	CE 3151	Engineering Graphics	0 0 4 2	CE(L), CS(L), EC(L), and EE(L)
	ES 3200	Environment and Ecology	3 0 0 3	AE, CE, CS, EC, EE, ME, & FO(Environment part is to be taught by faculty from CE, and Ecology part by faculty from FO. CC may be either from CE or FO on rotation/convenience basis)
	CE 4226	Basics of Civil Engineering	3 0 2 4	ME

Electives:

CE 4001 Construction Methods and Machinery

CE 4002 Water Resources Management

CE 4003 Architecture and Town Planning

CE 4005 Rural Water Supply and Sanitation

CE 4006 Biological Waste Water Treatment

CE 4007 Elements of Foundation Engineering

CE 4009 Environmental Management

COURSE CONTENTS

CE 3101 Fluid Mechanics I : 4 Credits (3-0-2)

Unit I	Properties of fluid: mass density, relative density, viscosity, fluid pressure, pressure head. Fluid statics - Pressure at a point, units of measurement, manometers, forces on plane areas, line of action of force, force components on curved surfaces.	10 lectures
Unit II	Fundamentals of fluid flow - steady, unsteady, uniform, non-uniform, one dimensional, two dimensional and three dimensional flows; Streamline, stream tube, irrotational flow, velocity potential, stream function, flow net, motion of a fluid element, acceleration of a fluid particle in a velocity field, fluid rotation, fluid deformation, .equation of continuity, energy equation and its applications.	10 lectures
Unit III	Fluid flow in pipes - Reynolds number, critical velocity, laminar flow, turbulent flow, shearing stresses at pipe wall, velocity distribution, loss of head for laminar flow, steady incompressible flow through simple pipe systems, Darcy - Weisbach equation, Moody diagram, simple pipe flow problems, losses of head for sudden expansion and sudden contraction, various fittings.	10 lectures
Unit IV	Fluid measurements - velocity measurement, Pitot tube, coefficient of discharge, coefficient of velocity, coefficient of contraction, orifices, orifice meter, venturimeter, time to empty tanks, weirs and notches.	6 lectures
Unit V	Introduction to open channel flow - prismatic and non-prismatic channels, equation of continuity for steady flow, uniform flow, Manning's formula, simple problems of steady uniform flow in rectangular and trapezoidal channels.	6 lectures

Recommended Books:

1. Hydraulics and Fluid Mechanics including Hydraulics Machines, Modi, P.N. and S.M. Seth, Standard Book House, Delhi, 1998.
2. Theory and Problems of Fluid Mechanics, Subramanya, K, Tata McGraw Hill, New Delhi, 1993.
3. Fluid Mechanics through Problems, Garde R.J. , New Age International, New Delhi., 1989.
4. A Text Book of Fluid Mechanics, Rajput, R.K. , S. Chand & Co, New Delhi., 1998.
5. Fluid Mechanics Hydraulics & Hydraulic Machines, Arora, K.R. , Standard Publishers & Distributions, Delhi., 1999.

CE 3102 Engineering Mechanics: 4 Credits (3-1-0)

Unit I	Equilibrium in Space: Forces in space, Rectangular components of a force in space, Unit vectors, Force defined by its magnitude and two points on its line action, Addition of concurrent forces in space, Equilibrium of a particle in space.	8 lectures
Unit II	Trusses, Frames and Machines: Simple, compound and complex trusses, Method of Joints, Zero-force members, Method of sections, Structures containing multi-force members, Analysis of determinate frames, simple machines.	10 lectures
Unit III	Principle of Virtual Work - Displacements, work due to a force and a couple, virtual displacement, applications; Potential energy and stability - Conservative systems and potential energy, Gravitational and elastic potential energy, Principles of potential energy, Stability of equilibrium.	8 lectures
Unit IV	Distributed Forces: Center of gravity of a two dimensional body, Centroid of areas, First moment of areas, Center of gravity of composite areas, Resultant of a general distributed force system, Moment of Inertia of an area, Radius of gyration of an area, Parallel axis theorem, Moment of Inertia of composite areas.	8 lectures
Unit V	Plain Kinematics of Rigid Bodies - Translation, rotation and general plane motion, velocities in relative motion, instantaneous center of velocity, accelerations in relative motion.	8 lectures

Recommended Books:
1. Vector Mechanics for Engineers, Statics and Dynamics, Beer and Johnston, Tata McGraw Hill, New Delhi, 1999.
2. Engineering Mechanics, Statics and Dynamics, Hibbeler, Pearson Education Asia Pvt. Ltd., New Delhi, 1997.
3. Engineering Mechanics, Statics and Dynamics, Meriam and Kraige, John Wiley & Sons INC, N.Y., 1997.
4. Engineering Mechanics, S Timoshenko, D H Young, and J V Rao, Tata McGraw Hill, New Delhi 2007
5. Engineering Mechanics, S S Bhavikatti and K G Rajashekharappa, John Wiley, NY, 1994.

CE 3103 Surveying I: 3 Credits (2-0-2)

Unit I	Introduction, classification of survey, chain surveying - principle, instruments used, procedure, Problems and errors in chain survey.	7 lectures
Unit II	Compass surveying: types, description and uses, measurement of bearings in WCB and QB systems, local attraction and related problems.	7 lectures
Unit III	Plane table surveying: methods of plane tabling, two- point and three- point problems and their solutions, errors in plane tabling.	7 lectures
Unit IV	Leveling: leveling principles, booking and reduction of levels, different types of leveling, related problems and practices.	7 lectures

Recommended Books:
1. Surveying Vol. I, B.C.Punamia, Laxmi Publications, New Delhi, 2005.
2. Surveying Vol. I, S.K.Duggal, Tata McGraw Hill, New Delhi, 1996.
3. Surveying and Levelling Vol. I, T.P. Kanetkar and S.V. Kulkarni, Pune Vidyarthi Griha Parkashan Pune, 2000
4. Surveying & Levelling, Rangwala, Charotar Publishing House, Anand, India, 2014.
5. Surveying Vol.I, Dr. K.R. Arora, Standard Book House, Delhi, 2013.

CE 3104 Principles of Civil Engineering: 3 Credits (3-0-0)

Unit I	Stones, bricks, tiles. Lime, cement, sand, concrete.	7 lectures
Unit II	Steel, timber, paints, bituminous materials, etc.	7 lectures
Unit III	Foundation, masonry works, lintels.	7 lectures
Unit IV	Doors windows, roofs. Flooring damp proofing, plastering, etc.	7 lectures
Unit V	Unit of measurements and payments, Methods of estimates & examples, Preparation of detailed estimates of earthwork, masonry, concreting, flooring.plastering, white washing and painting, wood and steel work, RCC work and sanitary fittings.	7 lectures
Unit VI	Estimate preparation for buildings, roads, culverts, water tank, septic tank and retaining wall, etc.; Rate analysis for construction, materials and various items of work.	7 lectures

Recommended Books:
1. Building Construction, Sushil Kumar, Standard Publications, Delhi, 1999.
2. Engineering Materials, Sushil Kumar, Standard Publications, Delhi, 1999.
3. Building Construction Vol-I to IV, W.B. Mackey, Orient Longman, Mumbai, 1993.
4. Text Book of Concrete Technology, P.D. Kulkarni, R.K. Ghosh & Y.R. Phull, New Age International, New Delhi,
5. Estimating & Costing in Civil Engineering, B.N. Dutta, UBS Publishers Distributors Ltd., New Delhi1, 1998.
6. Estimating & Costing Professional Practice, S.C. Rangwala, Charotar Publishing House, Anand, India, 1995.
7. Quantity Surveying: Estimating and Costing, P L Bhasin, S Chand & Co, Delhi, 1982.
8. Estimating, Costing, Specifications & Valuation, M Chakroborty, Author, Calcutta, 1992.

CE 3151 Engineering Graphics: 2 Credits (0-0-4)

Lines lettering & dimensioning; Engineering curves: Conic sections, Cycloid, Involute, Spiral, Helix etc.
Projection of Points, straight lines & planes.
Projection of solids, auxiliary views, and sectional views.
Development of surfaces, and Isometric drawings/views.

Recommended Books:
1. Elementary Engineering Drawing, N.D. Bhatt and V. M. Panchal, Charotar Publishing House, Anand, 2000.
2. Engineering Drawing, Venugopal, Wiley Eastern Ltd, New Delhi, 1992.
3. Engineering Drawing & Graphic Technology, French T.E., Vierck C.J. & Forester R.J., McGraw Hill International, Singapore, 1993.

CE 3201 Mechanics of Solids: 5 Credits (3-1-2)

Unit I	Mechanical Properties of Material, Axial Load, Direct shear, and Torsion: Stress-strain diagram for mild steel in tension and compression, Elastic behavior, Yield point, Strain hardening point, Stress-strain behavior of brittle materials, Hooke's law, Modulus of Resilience, Modulus of toughness, Poisson's ratio, Elastic deformation of an axially loaded member, Thermal stress, Direct shear stress, Shear strain, Modulus of rigidity, Torsion of a circular shaft, Power transmission, Deformation of a circular shaft, Angle of twist.	8 lectures
Unit II	Shear and Bending Moment Diagrams, Pure Bending: Shear force and bending moment at any point along the length of a beam, Regions of distributed loads, Concentrated loads and moments, Shear force and bending moment diagrams, Bending of a straight beam, Simple beam theory, Bending stress and its distribution, Composite beams, Transformed section.	10 lectures
Unit III	Transverse Shear: Shear on the horizontal face of a beam element, Horizontal shear per unit length, Transverse shear stress, The shear formula, Distribution of shear stress on the cross-section of a beam, Shear stress in the web of a thin walled section.	6 lectures
Unit IV	Plane Stress Transformation: General equation of transformation of plane stress, Principal stresses- magnitudes and their planes, Maximum shear stress and its plane, Mohr circle for plane stresses, Analytical and graphical solution of problems of plane stress.	6 lectures
Unit V	Deflection of Beams: Deformation of a beam under transverse loading,, The elastic curve, Moment-curvature relationship, Slope and deflection by direct integration, Boundary and continuity conditions, Equation of the elastic curve, Maximum deflection.	6 lectures
Unit VI	Columns: Euler's load for pin – ended columns, Columns with other end conditions, Critical load, Slenderness ratio, Effective length, Ratio of effective length and slenderness ratio, Eccentric loading and Secant formula, Euler's curve.	6 lectures

Recommended Books:
1. Elements of Strength of Materials, Timoshenko and Young, EWP, New Delhi, 1968
2. Strength of Material, G.H. Ryder, MacMillan, ELBS, London, 1969.
3. Engineering Mechanics of Solids, E.P. Popov, Prentice Hall of India, New Delhi, 1990.
4. Mechanics of Materials, Gere & Timoshenko, CBS Publications, New Delhi, 1984.
5. Strength of Material, Andrew Pytel and Ferdinanal L. Singer, Harper Collins Publishers, India, New Delhi, 1991.

CE 3202 Surveying II: 4 Credits (3-0-2)

Unit I	Contouring; Principles, methods and applications, contour gradient.	6 lectures
Unit II	Theodolite-description and adjustment of transit theodolite, measurement of angles and setting out lines. Introduction of Total Station.	10 lectures
Unit III	Trigonometrical leveling- Height and distance of objects with accessible and inaccessible base, Terrestrial refraction, determination of difference in elevation.	8 lectures
Unit IV	Tacheometry - Principles, field observations, reduction of readings, applications.	8 lectures
Unit V	Curve surveying - different methods of setting out curves – simple curves, compound curves, reverse curve, transition curve & vertical curves, related practice.	10 lectures

Recommended Books:
1. Surveying Vol.-I & II, B.C. Punamia, Laxmi Publications, New Delhi, 1994.
2. Surveying & Levelling, Vol.I & II, T.P. Kanetkar & S.V. Kulkarni, Pune Vidyarthi Griha Prakashan, Pune, 1985
3. Surveying Vol.-I & II, S.K. Duggal, Tata McGraw Hill, New Delhi, 1996.

CE 3221 Surveying for Forestry: 4 Credits (3-0-2)

Unit I	Contouring; Principles, methods and applications, contour gradient.	8 lectures
Unit II	Theodolite-description and adjustment of transit theodolite, measurement of angles and setting out lines.	8 lectures
Unit III	Trigonometrical leveling- Height and distance of objects with accessible and inaccessible base, Terrestrial refraction, determination of difference in elevation.	8 lectures
Unit IV	Tacheometry - Principles, field observations, reduction of readings, applications.	8 lectures
Unit V	Curve surveying - different methods of setting out curves – simple curves, compound curves, reverse curve, related practice.	10 lectures

Recommended Books:
1. Surveying Vol.-I & II, B.C. Punamia, Laxmi Publications, New Delhi, 1994.
2. Surveying & Levelling, Vol.I & II, T.P. Kanetkar & S.V. Kulkarni, Pune Vidyarthi Griha Prakashan, Pune, 1985
3. Surveying Vol.-I & II, S.K. Duggal, Tata McGraw Hill, New Delhi, 1996.

ES 3200 Environment and Ecology: 3 Credits (3-0-0)

Unit I	**Basic Concept of Environment and Ecology:**Introduction, types of environment, components of environment, environmental studies, need for public awareness, Introduction to ecosystem, classification of ecosystem, structure of ecosystems, functioning of ecosystems, balance of ecosystems.	8 lectures
Unit II	**Environmental Impact of Human Activities:**Impact of industrialization, modern agriculture, housing, mining, and transportation on environment.	6 lectures
Unit III	**Natural Resources:**Classification of natural resources, water resources, mineral resources, forest resources, material cycles, energy resources, electromagnetic radiation.	8 lectures
Unit IV	**Environmental Pollution:**Types of environmental pollution, water pollution, waterborne diseases, land pollution, noise pollution, air pollution, automobile pollution, effects of environmental pollution, public health aspects, solid waste management.	9 lectures
Unit V	**Current Environmental Issues:**Population growth, global warming, climate change, urbanization, acid rain, ozone layer depletion, animal husbandry.	5 lectures
Unit VI	**Environmental Protection:**Role of Government, Legal aspects, initiativesby NGOs, environmental education, women's education.	6 lectures

Recommended Books:
1. Textbook of Environment & Ecology – Dave, D. and Katewa, S. S., Cenage Learning India Pvt. Ltd, Delhi. 2010.
2. Textbook of Environmental Studies – Bharucha, E., Universities Press (India) Pvt. Ltd., Hyderabad. 2010.
3. Environmental Studies: From Crisis to Cure – Rajgopalan, R., Oxford University Press, New Delhi. 2008.
4. Fundamentals of Ecology – Dash, M. C. and Dash, S. P., Tata McGraw Hill Education Private Limited, New Delhi. 2009.
5. Principles of Environmental Science & Engineering – Rao, P. V., PHI Learning Pvt. Ltd., New Delhi. 2009.
6. Elements of Environmental Science & Engineering – Meenakshi, P., PHI Learning Pvt. Ltd., New Delhi. 2009.
7. Environmental Science & Engineering – Debi, A. University Press (India) Pvt. Ltd. Hyderabad. 2008.

CE 4101 Structural Analysis: 5 credits (3-1-2)

Unit I	Deflection of Beams: Bernoulli-Euler beam equation, Slope and Deflection by Moment- Area and Conjugate Beam methods.	8 lectures
Unit II	Deflection of Beams, Trusses and Frames by Work-Energy Methods: Principles of virtual displacements for rigid bodies, Principles of virtual displacements for deformable bodies, Principles of virtual forces for deformable bodies, Deflection of beams by virtual work method, Deflection of pin-jointed truss joints, Effect of temperature change and fabrication errors, Deflection of determinate frames by the virtual work, Principles of conservation of energy, Strain energy due to axial loads and moments, Castigliano's theorems, Application of Castigliano's second theorem to beams, trusses and frames, Betti's law and Maxwell's law of reciprocal deflection.	12 lectures

Unit III	Cables and Arches: Cables subjected to concentrated loads and uniformly distributed loads, Three Hinged Arch, Three-hinged trussed arch, Tied three-hinged trussed arch.	6 lectures
Unit IV	Influence Line Diagrams for Statically Determinate Structures: ILD for Reaction, Shear, Bending Moment at a point, for determinate beams, floor girder, arches and member force in trusses.	10 lectures
Unit V	Introduction to Statically Indeterminate Structures: Degree of indeterminacy and stability, principles of superposition, Analysis of indeterminate beams with single degree of indeterminacy by Consistent Deformation Method.	6 lectures

Recommended Books:
1. Structural Analysis, 6th Edition, R C Hibbeler, Pearson Education, New Delhi, 2008.
2. Structural Analysis, Aslam Kassimali, PWS Publishing, 1999.
3. Basic Structural Analysis, C S Reddy, Tata McGraw Hill, New Delhi, 1996.
4. Elementary Structural Analysis, S. Utku, C H Noris, and J.B. Wilbur, McGraw Hill, N.Y., 1991.
5. Theory of Structures, Timoshenko and Young, McGraw Hill, N.Y., 1965.

CE 4102 Water Resources Engineering I: 4 Credits (3-0-2)

Unit I	Hydrological cycle - precipitation, measurement of precipitation, mass curve, hydrograph, point rainfall, depth-area-duration relationships, depth area duration curve, maximum intensity duration frequency curve. evapotranspiration and infiltration.	10 lectures
Unit II	Stream flow measurement, measurement of stage and velocity; Rainfall - runoff characteristics, rainfall runoff correlation, flow duration curve, flow mass curve. Hydrographs - definition, influencing factors and components of a hydrograph, base flow separation, effective rainfall, unit hydrograph, use and limitations.	12 lectures
Unit III	Groundwater - forms of surface water, aquifer, aquitard, aquiclude, aquifuse; Aquifer properties, specific yield and specific retention, Darcy's law, hydraulic conductivity, transmissibility - steady flow in a well.	10 lectures
Unit IV	Crops and crops season; Soil - water relationships, field capacity, consumptive use, requirement and frequency of irrigation; Canal irrigation, Canal outlets. Water logging and Canal lining. River training works.	10 lectures

Recommended Books:
1. Engineering Hydrology, Subramanya, K., Tata McGraw Hill, New Delhi, 2006.
2. Hydrology, Principles, Analysis and Design, Raghunath, H.M., New Age International, New Delhi, 1985.
3. Applied Hydrology, Chow, VT, D R Maidment and L W Mays, McGraw Hill Book Company, New York, 1988.
4. Elementary Hydrology, Singh, V.P., Prentice-Hall India, New Delhi, 1994.
5. A Text Book of Hydrology, Rani Reddi, P.J., Laxmi Publications, New Delhi ,1999.
6. Irrigation and Water Power Engineering. Punmia, B.C. and Pandey, B.B. Lal, Laxmi Publication, Delhi, 1986.
7. Irrigation Engineering, Asawa, G.L., New Age International, New Delhi, 1993.

CE 4103 Geotechnical Engineering I: 4 Credits (3-0-2)

Unit I	Introduction; Preliminary definitions and relationships; Index properties of soils; Classification of soils.	10 lectures
Unit II	Soil structure and Clay mineralogy; Soil compaction; Flow of water in soils: permeability and seepage.	8 lectures
Unit III	Effective stress concepts; Stress distribution in a soil mass; One-dimensional consolidation of soil.	8 lectures
Unit IV	Shear strength of soils: theoretical considerations and tests.	8 lectures
Unit V	Introduction to shallow and deep foundations; Introduction to soil exploration.	8 lectures

Recommended Books:
1. Principles of Soil Mechanics and Foundation Engineering, Murthy, V.N.S.,UBSPD, New Delhi, 2001.

2. Principles of Geotechnical Engineering, Das, B.M., PWS and ITP Pub. Company, London, 1998.
3. Soil Engineering Part-I: Fundamentals and General Principles, Singh, Alam and Chowdhary, G.R., CBS, New Delhi, 1994.
4. Soil Mechanics and Foundation Engineering, Punmia, B.C., Standard Book House, Delhi, 2001.
5. Principles of Foundation Engineering, Das, B.M., Bostova Cole Publishing Co, London, 1999.

CE 4104 Environmental Engineering-I: 4 Credits (3-0-2)

Unit I	Introduction, Estimation of quantity of water, per capita demand, design period, population forecasting.	8 lectures
Unit II	Sources of water and their suitability with regard to quality & quantity, storage capacity of reservoirs, water quality parameters, standards.	8 lectures
Unit III	Treatment of water- screenings, sedimentation, aeration, coagulation and flocculation, filtration & disinfection, Storage Reservoir, distribution system, methods of water supply.	8 lectures
Unit IV	Sewerage system, estimation of quantity of sewage, dry weather flow (DWF), wet weather flow (WWF), variation in flows, hydraulic design of sewers, pumping of sewage.	8 lectures
Unit V	Characteristics of sewage, strength of sewage, population equivalent, treatment of sewage- primary and secondary treatments, oxidations ponds, sewage disposal, self –purification of streams, sludge digestion and disposal, concept of air pollution control.	10 lectures

Recommended Books:
1. Environmental Engineering Vol. I: Water Supply Engineering, S.K. Garg, Khanna Publications, Delhi, 2009.
2. Environmental Engineering Vol II: Sewage Disposal and Air Pollution Engineering, S.K. Garg, Khanna Publications, Delhi, 2009.
3. Environmental Engineering, Peavy, Tachobanoglous & Rowe, McGraw Hill International, N.Y., 1985.
4. Wastewater Engineering: Treatment, Disposal and Reuse, Metcalf & Eddy, Tata McGraw Hill, New Delhi, 2003.
5. Water Supply Engineering (Environmental Engineering Vol. I): P. N. Modi, Standard Book House, N. Delhi. 2010.
6. Water Supply & Sanitary Engineering, G.S. Birdi and J.S. Bindie, Dhanpat Rai Publishing Co., New Delhi, 1998.

CE 4105 Concrete Technology: 4 Credits (3-0-2)

Unit I	Concrete: Importance, grades, Ingredients, Cement: Objective, Composition, Varieties and respective advantages; Aggregates: Objectives, Classification, Characteristics and properties of aggregates; Water: Quality, Mixing and Curing.Admixtures: Objective, Types of admixture and compounds.	10 lectures
Unit II	Quality Control - Influencing Parameters, advantages, measure of variability and Statistical Quality Control, Yield of concrete, Concrete mix proportioning using BIS and IRC methods.	7 lectures
Unit III	Production of concrete: Batching, mixing, transporting, placing, compacting, finishing, curing; operations involved in pavement concreting.	5 lectures
Unit IV	Rheology of fresh concrete, Properties of fresh and hardened concrete.	10 lectures
Unit V	Special Concrete - Ferro-Cement, Polymer Concrete Composites, Lightweight, Heavy weight concrete, Fibre reinforced concrete, Dry lean concrete, Pavement quality concrete, Roller compacted concrete, Mass concrete, Gunniting.	10 lectures

Recommended Books:
1. Concrete Technology, A. M. Neville and J. J. Brooks, Pearson Education Asia, 1999.
2. Concrete Technology, M L Gambhir, Tata McGraw Hill, New Delhi, 1995.
3. Concrete Technology, P. D. Kulkarni, R. K. Ghosh and Y. R.Phull, New Age International, New Delhi, 1998.
4. Concrete Technology, M S Shetty, S. Chand & Company, New Delhi, 2005(e).
5. Concrete for Construction, V K Raina, Tata McGraw Hill, New Delhi, 1988.
6. Concrete Technology, A. R. Santhakumar, Oxford University Press, New Delhi, 2007.
7. IS 16415: 2015, Composite Cement – Specification, BIS.
8. IS 456: 2000, Plain and Reinforced Concrete - Code of Practice, (4th Revision), BIS.
9. IS 10262: 2009, Concrete Mix Proportioning – Guidelines BIS.
10. IS 383, 1970, Specification for Coarse and Fine Aggregates from Natural Sources for Concrete, BIS.
11. Concrete Manual: Laboratory Testing for Quality Control of Concrete, M L Gambhir, Dhanpat Rai & Sons, New Delhi, 1987

CE 4201 Design of RCC Structures - I: 4 Credits (3-1-0)

Unit I	Introduction to design; Concrete and Reinforced Concrete.Philosophy of Limit State Design; Different limit states. Characteristic strengths and loads; codal provisions; design values/ parameters.	8 lectures
Unit II	Design for flexure of singly and doubly reinforced rectangular beams.	8 lectures
Unit III	Design for flexure of flanged beams T and L beams.	6 lectures
Unit IV	Design of beams for shear, torsion, development and bond, control of deflections in beams and slabs.	6 lectures
Unit V	One way, Two way and Continuous slabs.	8 lectures
Unit VI	Axially loaded short and long columns. Uniaxial bending of columns, Isolated footings.	6 lectures

Recommended Books:
1. LimitState Design of Reinforced Concrete, 2nd Edition, P C Varghese, Prentice Hall of India, New Delhi, 2002.
2. Reinforced Concrete Design, 2nd Edition, S Unnishrishna Pillai and Davdas Menon, Tata McGraw Hill, New Delhi, 2003.
3. Design of Reinforced Concrete Design, N Subramanian, Oxford University Press, New Delhi, 2013
4. LimitState Design of Reinforced Concrete, B C Punmia, Ashok K. Jain and Arun K Jain, Laxmi Publications, Delhi, 2007.
5. IS: 456-2000, Code of Practice for Plain and Reinforced Concrete, BIS, New Delhi.
6. SP 16 Design Aids to IS 456 1978, BIS, New Delhi
7. SP 24 Explanatory Handbook on IS 456 Code of Practice for Plain and Reinforced Concrete, BIS, New Delhi.
8. SP 34 Handbook on Concrete Reinforcement and Detailing, BIS, New Delhi

CE 4202 Design of Steel Structures-I: 4 Credits (3-1-0)

Unit I	Properties of steel and rolled steel sections. Design of riveted connections.	7 lectures
Unit II	Design of welded and bolted connections.	7 lectures
Unit III	Design of tension and simple compression members.	7 lectures
Unit IV	Design compression members with splicing, lacing, and battening.	7 lectures
Unit V	Design of Beam-Column connections; Design of laterally supported beams.	7 lectures
Unit VI	Column bases and foundations and Roof trusses.	7 lectures

Recommended Books:
1. Design of Steel Structures, L.S. Negi, Tata McGraw Hill, New Delhi, 1996.
2. Design of Steel Structures Vol. I, 10th Edition, Ram Chandra, Standard Book House, Delhi, 2006
3. Design of Steel Structures, P Dayaratnam, Wheeler Publishing, Allahabad, 1990.
4. Steel Structures, A S Arya and J L Azmani, Nem Chand & Brothers, Roorkee, India, 1996.
5. Structural Design in Steel, Sarwar Alam Raj, New Age Publications, New Delhi, 2002.
6. Design of Steel Structures, Kazmi and Jindal, Prentice Hall of India, New Delhi, 1987.

CE 4203 Transportation Engineering I: 4 Credits (3-0-2)

Unit I	Roads: Introduction, Highway development in India, Classification of Road patterns, Master Plan, Road Network and Characteristics.	6 lectures
Unit II	Geometric Design of Highways - Factors, cross-section elements, sight distances, horizontal and vertical curves, transition curves, Related Practice.	10 lectures
Unit III	Traffic Engineering: Introduction, traffic characteristics, traffic sign and signal, traffic control devices.	10 lectures
Unit IV	Railways: Geometrics for Broad Gauge, Cant deficiency, Sleeper Density, Design of Ballast Depth. Points and Crossings, Station and Yards, Signals.	10 lectures
Unit V	Airport: Characteristics, Planning considerations.	6 lectures

Recommended Books:
1. Highway Engineering, S K Khanna , C E G Justo and A.Veeraraghavan, Nem Chand & Brothers, Roorkee, India, 2015.
2. Principles of Transportation Engineering, P. Chakroborty and A. Das, Prentice Hall of India Pvt. Ltd., 2003.
3. Railway Engineering, Chandra, Satish, Agarwal, M.M., OXFORD University Press, New Delhi, 2013.
1. A Text Book of Railway Engineering, Arora and Saxena, Dhanpat Rai & Sons, New Delhi, 2010.
2. Airport: Planning and Design, Khanna and Arora, Nem Chand & Brothers, Roorkee, India, 1990.

CE 4204 Building Planning and Drawing: 4 Credits (2-0-4)

Unit I	Model Building Byelaws for urban centres in plain and hilly region, Growing Environmental concerns, Increased Safety and Security measures, Technological Developments, Swachh Bharat Mission, Development permission; site planning.	7 lectures
Unit II	Planning for utility - Principles of building planning for utility, aspects, prospect, grouping, circulation, privacy, furniture layout, sanitation, elegance, economy flexibility.	7 lectures
Unit III	Planning for Aesthetic - Principles of architecture, Quality of architecture, factors in architecture, etc.	7 lectures
Unit IV	Planning and designing of different types of buildings: residential building, school building, library building, auditorium building, hotel building, bus stand, etc.	7 lectures

Recommended Books:
1. Model building bye laws, Town and Country Planning Organisation, Ministry of Urban Development, New Delhi, 2016.
2. National Building Code, Part I, BIS, 2005.
3. Planning and Designing of Residential Buildings, Y.N. Raja Rao & YSubrahmanyam, Standard Publisher, New Delhi, 2000.
4. Planning and Designing Buildings, Y.S. Sane, Engineering Book Publishing Co., Pune, 1959.
5. The Great Ages of World Architecture, G.K. Hiraskar, Dhanpat Rai & Sons, New Delhi, 1994.
6. Time Saver Standard: Architectural Design Data, Callender, McGraw Hill International, Singapore, 1982.
7. Time Saver Standard: Building Types, De Chiara and Callender, McGraw Hill International, Singapore, 1990.

CE 4205 Construction Management and Accounts: 2 Credits (2-0-0)

Unit I	Scientific management, Need of management, function and application of management, organization, site and construction management.	7 lectures
Unit II	Control and monitoring of progress, Cost control, Inspection and quality control.	7 lectures
Unit III	Network analysis, PERT and CPM.	6 lectures
Unit IV	Labour welfare and labour law. Departmental procedure and accounts, PWD accounts. Stores and material management.	8 lectures

Recommended Books:
1. Construction Management and Accounts, Harpal Singh, Tata McGraw Hill, New Delhi, 1981.

2. Construction Management Practices, V K Raina, Tata McGraw Hill, New Delhi, 1988.
3. Management in Construction Industry, P.P.Dharwadker, Oxford & IBH, New Delhi, 1979.
4. Construction Planning & Management, P.S. Gahlot &B.M Dhir, New Age International, New Delhi, 1992.

CE 4226 Basics of Civil Engineering: 4 Credits (3-0-2)

Unit I	Surveying: chain, compass, plane table surveying and leveling. Related practices.	12 lectures
Unit II	Building Construction: foundation, masonry work, concrete and RC elements in buildings, doors and windows, roofs, finishes; Industrial structures; Machine foundations.	10 lectures
Unit III	Water supply and Sanitary services: sources of water supply, conveyance of water through pipes, pumping, principles of water and waste water treatment, working and construction of septic tanks and soak pits.	10 lectures
Unit IV	Elements of roads, railways and bridges.	10 lectures

Recommended Books:
1. Surveying Vol.I, B.C. Punmia, Laxmi Publications, New Delhi, 2005.
2. Surveying and Levelling Vol.I, T.P. Kanetkar and S.V. Kulkarni, Pune Vidyarthi Griha Parkashan Pune, 2000
3. Building Construction, Sushil Kumar, Standard Publishers, Delhi, 2015.
4. Environmental Engineering Vol. I: Water Supply Engineering, S.K. Garg, Khanna Publications, Delhi, 2010.
5. Environmental Engineering Vol. II: Sewage Disposal & Air Pollution Engineering, S.K. Garg, Khanna Publications, Delhi, 2010.
6. Elements of Civil Engineering, Dr. Anurag Kandya, Charotar Publishing House, Anand, India, 2015.

CE 4001 Construction Methods and Machinery: 4 Credits (3-1-0)

Unit I	Engineering and construction economy, steps involved in construction.	8 lectures
Unit II	Supervision of concreting in hot and cold climate, quality control, precautions to be taken in construction of highrise buildings.	8 lectures
Unit III	Erection of steel structures. Use of compressed air in construction.	10 lectures
Unit IV	Standard and special equipments, Selection, operation and maintenance of equipments.	8 lectures
Unit V	Construction accidents; types and causes, effective preventive measures.	8 lectures

Recommended Books:
1. Construction Equipments, Job Planning, S.V. Deodhar, Khanna Publishers, New Delhi, 1988.
2. Construction of Structures & Management of Works, S.C. Rangawala, Charotar Publishing House, Anand, India, 1985.
3. Construction Planning Equipments and Methods, R.L. Peurifoy, W B Ledbetter and C J Schexnayder, McGraw Hill, NY, 1996.

CE 4002 Water Resources Management : 4 Credits (3-1-0)

Unit I	Water resources development: Socio-economic objective, Social cost-benefit, Environmental and ecological objectives.	7 lectures
Unit II	Evaluation criteria, Watershed functional analysis.	7 lectures
Unit III	Soil-sub system analysis, Groundwater sub-system, Stream flow generation.	7 lectures
Unit IV	Agricultural demand; Water conveyance and distribution, reservoir system.	7 lectures
Unit V	Conjunctive surface and groundwater. Management of river basin.	7 lectures
Unit VI	Drainage requirements: Drainage system management, Wasteland development for agriculture recreation.	7 lectures

Recommended Books:
1. Watershed Management, Murthy, J.V.S., New Age International, New Delhi, 1994.
2. Land and Water Management Engineering, Murthy, V.V.N., Kalyani Publications, New Delhi, 1985.
3. Watershed Management, V V D Narayana, G Sastry, and U S Pattanaik, ICAR Publication and Information Div, New Delhi, 1997.

CE 4003 Architecture and Town Planning: 4 Credits (3-0-2)

Unit I	Brief history of architecture, evolution of structural forms, Impact of materials and construction technique; Philosophy of architectural design.	7 lectures
Unit II	Functional and Aesthetic requirements, scale & proportion, colour, texture, composition of space etc. Modern architecture.	7 lectures
Unit III	Acoustics of auditorium, lighting of buildings like school, hospital, and library, Interior decoration & Landscape Architecture.	7 lectures
Unit IV	Principles of urban planning, land-use pattern, population density.	7 lectures
Unit V	Services & transportation, concept of habitat including environment problem of metropolis.	7 lectures
Unit VI	Satellite town, concept garden city, integrated growth, housing, master plan, neighborhood planning & action plan.	7 lectures

Recommended Books:
1. Watershed Management, Murthy, J.V.S., New Age International, New Delhi, 1994.
1. Planning & Designing Building, Y.S. Sane, Engineering Book Publishing Co. Pune, 1959.
2. Fundamentals of Town Planning, G.K. Hiraskar, Dhanpat Rai & Sons. New Delhi, 1989.
3. Town Planning, R.C. Rangwala, Charotar Publishing House, Anand, India, 1999.
4. Urban Patterrn, A.B. Gallion, CBS Publications, New Delhi, 1986.
5. The Great Ages of World Architecture, G.K. Hiraskar, Dhanpat Rai & Sons, New Delhi, 1994.
6. Development Control Rules for Class A Town, Respective Municipal Corporation/ N.B.C., Latest Publication.
7. National. Building Code, B I S.

CE 4005 Rural Water Supply and Sanitation: 4 Credits (3-1-0)

Unit I	Sources: Selection of sources, surface sources - springs, streams, rivers, lakes, ponds etc., under ground sources; wells and tube wells.	8 lectures
Unit II	Quality aspects of rural water supply, Examination of water quality parameters- physical, chemical and biological parameters and their significance.	8 lectures
Unit III	Design considerations for rural water supply schemes, Appropriate technology in rural water supply, Design, treatment and distribution of water.	10 lectures
Unit IV	Rural Sanitation: Refuse collection and disposal, sanitary latrines, privies, protection of water sources.	8 lectures
Unit V	Biogas generation: Basic principles of anaerobic degradation, various types of biogas plants, design considerations of various biogas digesters.	8 lectures

Recommended Books:
1. Rural Water Resources Utilization & Planning, Ram Bilas, Concept Publishing, New Delhi, 1988.
2. Manual for Rural Water Supply, SKAT-SwissCenter for Appropriate Technology, Switzerland, Geo-Environ Academia, Jodhpur, 1989.
3. Renewable Energy Sources and Their Environmental Impact, S A Abbasi and N Abbasi, Prentice Hall of India, New Delhi, 2001.
4. Introduction to Environmental Engineering, Davis& Corn Well, McGraw Hill International, N.Y., 1996.
5. Introduction to Environmental Science and Engineering, A.K. Datta, Oxford & IBH, New Delhi, 2000.
6. Environmental Engineering, M. N. Rao and V. Thanikachalam, Tata McGraw Hill, New Delhi, 1993.
7. Rural Waste Management, A C Varshney, Associated Publishing Co, New Delhi, 1987.
8. Municipal and Rural Sanitation, V M Ehlers, and E W Steel, Tata McGraw Hill, New Delhi, 1976.

CE 4006 Biological Waste Water Treatment: 4 Credits (3-1-0)

Unit I	Introduction, Principles of biological treatment: Aerobic and anaerobic treatment; bioconversion processes, kinetics of bioconversion.	8 lectures
Unit II	Aerobic treatment: Activated sludge process, trickling filter, aerated lagoons, aerobic filters, rotating biological contactors, roughing filters.	8 lectures
Unit III	Low-cost wastewater treatment: oxidation ponds, fishponds, maturation ponds, oxidation ditches.	8 lectures
Unit IV	Anaerobic treatment: Conventional and high rate anaerobic digesters, anaerobic filters: up flow filters – fixed bed and submersed media anaerobic reactor, expanded bed, fluidized bed and moving bed reactors, down flow stationary fixed film reactors.	10 lectures
Unit V	Advanced Anaerobic treatment: Up flow anaerobic sludge blanket reactor (UASB) and hybrid reactors. Anaerobic rotating biological contactors.	8 lectures

Recommended Books:
1. Wastewater Treatment Concept and Design Approach: G. L. Karia & R. A. Christian, PHI, N. Delhi.
2. Wastewater Treatment for Pollution Control and Reuse, S. J. Arceivala, Asolekar, Tata McGraw Hill, New Delhi.
3. Water and Wastewater Engineering, Desogh Principles and Practice: Mackenzie L. Davis, McGraw Hill Education (India) Private Limited, New Delhi, 23015.
4. Environmental Engineering Vol II: Sewage Disposal and Air Pollution Engineering, S.K. Garg, Khanna Publications, Delhi. 2009.
5. Sewage Treatment & Disposal and Waste Water Engineering (Environmental Engineering Vol. II): P. N. Modi, Stabdard Book House, N. Delhi. 2008.
6. Environmental Engineering Vol II: Sewage Disposal and Air Pollution Engineering, S.K. Garg, Khanna Publications, Delhi, 1990.
7. Wastewater Treatment Plants: Planning, Design & Operation, S.R. Qasim, CBS College Publishing, NY, 1985.
8. Wastewater Engineering: Treatment, Disposal and Reuse, MetCalf and Eddy, Tata McGraw Hill, New Delhi, 1991.
9. Environmental Engineering, Peavy, Rowe and Tachbangolous, McGraw Hill International, New York, 1985.

CE 4007 Elements of Foundation Engineering: 4 Credits (3-1-0)

Unit I	Soil investigation: boring in open pits, sampling, laboratory and field tests, SPT, plate load tests, geophysical explorations.	10 lectures
Unit II	Shallow foundations: bearing capacity theories of Terzaghi and Meyerhof, general, local and punching shear failures, IS recommendations; Settlement of foundations, factor affecting settlements, allowable bearing pressure, proportioning of footings.	12 lectures
Unit III	Deep foundations: pile foundations, classification, bearing capacity of pile foundations, pile driving formulae, pile load tests, bearing capacity of under-reamed piles.	10 lectures
Unit IV	Pile groups, group efficiency, Converse Labarre formula, settlement of piles; Structural design of deep foundations; Constructional methods.	10 lectures

Recommended Books:
1. Principles of Soil Mechanics and Foundation Engineering, Murthy, V.N.S.,UBSPD,New Delhi, 2001.
2. Soil Engineering Part-I: Fundamentals and General Principles, Singh, Alam and Chowdhary, G.R., CBS, New Delhi, 1994.
3. Introduction to Soil Mechanics and Shallow Foundations Design, French, Samuel E., Prentice Hall Inc, NJ, 1989.
4. Geotechnical Engineering: Foundation Design, Cernica, John N., John Wiley & Sons, Singapore 1994.
5. Design of Foundation Systems, N.P. Kurian, Narosa Publishing House, New Delhi, 1994.

CE 4009 Environmental Management: 4 Credits (3-1-0)

Unit I	Introduction, Principles of Environment Management, basics of water, land, air management, salient features of environment management.	8 lectures
Unit II	Management of wastewater from combined sewers, Computation of flow rates, design of sewers, waste disposal.	8 lectures
Unit III	Management of air pollutants, control of gaseous and particulate matters, dispersion model for air pollutants.	8 lectures
Unit IV	Management of solid wastes, material flow in a society, collection, handling, processing and safe disposal of solid wastes.	10 lectures
Unit V	Socio -economic aspects of Environmental Management.	8 lectures

Recommended Books:
1. Environment Management: An Indian Perspective, Ed: S N Chary and V Vyasulu, MacMillan India Ltd, New Delhi, 2000.
2. Environmental Risks & Hazards, S.L. Cutter, Prentice Hall of India, New Delhi, 1999.
3. Environmental Audit- An Overview, A.K. Mahaskar, Media Enviro, Pune, 1990.
4. Environmental Accounting, N Das Gupta, Wheeler Publishing, Allahabad, 1997.
5. Environmental Management, B Narayan, A P H Pubkishing Corp, New Delhi, 2000.
6. Hazardous Waste Management, C A Wentz, McGraw Hill Inc, Singapore, 1995.
7. Legal Aspects of Environmental Pollution and its Management, Ed: S Masharaf Ali, CBS Publications, Delhi, 1992.

Department of Computer Science & Engineering
Programme: Diploma in Computer Science & Engineering

Year I Semester I

Course	Code	Course Title	L	T	P	C
HS	3101+	Communication Skill	2.	0	2	3
CY	3101+	Chemistry III	3	0	2	4
PH	3102 +	Physics III-B	2	0	2	3
MA	3101	Engineering Mathematics - I	3	1	0	4
CS	3102	Object Oriented Programming with C++	3	0	4	5
CS	3103	Switching Circuits and Logic Design	3	1	2	5
CE	3151*	Engineering Graphics	0	0	4	2
EE	3101 *	Basics of Electrical and Electronics Engineering	4	0	2	5
ME	3151*	Comprehensive Workshop - I	0	0	6	3
CS	3177*	Principles of Computers (Audit)	2	0	2	3
		Total				**24/(24+3*)**

+ Bridge for 10+2 Vocational/NERIST Certificate
* Bridge for 10+2 (PCM)

Semester II

Course	Code	Course Title	L	T	P	C
ES	3200	Environment & Ecology	3	0	0	3
MA	3201	Engineering Mathematics-II	3	1	0	4
PH	3201	Physics IV- A	2	0	2	3
CY	3201	Engineering Chemistry -I	3	0	2	4
EC	3221	Basic Electronics Circuit and Devices	3	0	2	4
CS	3201	Programming Tools and Techniques	2	0	6	5
		Total				**23**

Year II   Semester I

Course	Code	Course Title	L	T	P	C
HS	4101	Principles of Economics	3	0	0	3
EC	4121	Electronics Circuits & Devices	3	0	2	4
CS	4100	Computer Networking Concepts & Devices	3	0	0	3
CS	4101	Data Structures -I	3	0	2	4
CS	4102	Application Software	3	0	4	5
CS	4103	Computer Organization & Architecture	3	1	2	5
CS	4104	Principles of Programming Languages	3	0	0	3
		Total				**27**

Semester II

CS	4200	Microprocessors		3	1	2	5
CS	4201	Operating Systems		3	0	0	3
CS	4202	Programming in Java		3	0	2	4
CS	4203	Data Structures -II		3	1	2	5
CS	4299	Project		0	0	6	3
CS	40**	Elective		3/3	0/1	2/0	4
CS	4204	Computer Graphics		2	0	2	3
ED	4288	Extra Curricular Activities & Discipline		-	-	-	2
			Total			**29(27+2)**	

List of Electives

CS	4000	Data Processing and File System		3	0	2	4
CS	4001	Web Technology		3	0	2	4
CS	4002	Graphics Design and Modelling		3	0	2	4
CS	4003	Real Time Systems		3	1	0	4

Common Courses

ES	2200	Basics of Computers and Programming (in C)		2	0	2	3
ES	3100	Object Oriented Programming with C++		2	0	4	4
ES	4377	Comprehensive Programming with C/C++		2	0	4	4

Courses offered to Forestry Department

CS	3101	Basics of Computers		2	0	2	3
CS	4400	Programming with C++		3	0	2	4

COURSE CONTENTS

CS 3101 Basics of Computers: 3 Credits (2-0-2)

Unit I	Introduction to Computers - Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Program Development. Digital computer fundamentals: flowcharts, the von Neumann architecture, programs, assembly language, high level programming languages, text editors, operating systems. Introduction to the C Language - Background, C Programs, Identifiers, Types, Variables, Constants, Input / Output,Operators(Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Statements- Selection Statements(making decisions) - if and switch statements, Repetition statements (loops)- while, for, do-while statements,Loop examples, other statements related to looping -break, continue, goto, Simple C Program examples.	6 lectures
Unit II	Functions-Designing Structured Programs, Functions, user defined functions, inter function communication, Standard functions, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Limitations of recursion, example C programs, Preprocessor commands. Arrays - Concepts, using arrays in C, inter function communication, array applications, two - dimensional arrays, multidimensional arrays	6 lectures
Unit III	Pointers - Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, Pointer Applications-Arrays and Pointers, Pointer Arithmetic and arrays, Passing an array to a function, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions. Strings - Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion.	6 lectures
Unit IV	Enumerated, Structure ,and Union Types- The Type Definition (typedef), Enumerated types, Structures -Declaration, initialization, accessing structures, operations on structures, Complex structures, structures and functions, Passing structures through pointers, self-referential structures, unions, bit fields, C programming examples, command -line arguments.	6 lectures
Unit V	Input and Output - Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input / output functions (standard library input / output functions for files), file status functions (error handling),Positioning functions, C program examples.	4 lectures

Recommended Books:

1. C Programming Absolute Beginner's Guide (3rd Edition) - Greg Perry, Dean Miller, Pearson Education
2. Programming with C, Byron Gottfried, McGraw Hill International, New York, 1996.
3. The C programming Language, Kernighan B W & Ritchie Denison, 2nd Ed., Prentice Hall of India, New Delhi, 1990.

CS 3102 Object Oriented Programming with C++ :5 Credits (3-0-4)

Unit I	Overviews of C, Procedural Vs Object Oriented Programming(OOP), characteristics of OOP, Variables, constants, operators in C++, Functions: Function Prototyping, Call by reference, Call by Value, Return by Reference, Inline Function, Namespace in C++, Classes and Objects, Scope resolution operator, public, private access specifier, Object instantiation, array of objects, passing objects to member functions, this pointer	8 lectures

Unit II	Constructors, Default Constructor, Parameterized Constructors, Dynamic memory allocation using new,delete, Destructors, Friend Functions/ClassesCopy Constructors, Usage of reference (&) variables, Introduction to overloading, Constructor overloading, Function overloading, Operator overloading, unary operator overloading, Binary operator overloading, Use of friend function in operator overloading	8 lectures
Unit III	String manipulation using operators. Introduction to Inheritance, Base pointers, virtual base classes, Abstract classes, Constructors in Derived classes, Types of inheritance, Nesting of classes, Pointers, Pointer to ObjectPointer to Derived class, Virtual Function, Pure Virtual Function, Run-time Type Polymorphism, Compile-time type polymorphism	10 lectures
Unit IV	Streams classes, Disk File I/O with streams, File pointers, Error handling in File I/O with member functions, Memory as a stream object, Command Line arguments, Printer output, Introduction to templates, Function Templates, Class templates Exceptions	8 lectures
Unit V	Introduction to STL, Containers, Algorithms, Iterators, Specialised Iterators Associative Containers, Sequence Containers,Function Objects	8 lectures

Recommended Books:

1. Stephen Prata, "C++ Primer Plus", Sixth Edition, Pearson, 2012
2. S. B. Lippman& J. Lajoie, "C++ Primer", 5th Edition, Addison Wesley, 2012.
3. Bjarne Stroustrup, "The C++ Programming Language", 4th Edition, Pearson, 2013.

CS 3103 Switching Circuits and Logic Design: 5 Credits (3-1-2)

Unit I:	Logic gates, Switching circuits, Number systems and Codes, Arithmetic circuits, Boolean/Switching algebra, Boolean/Switching function.	8 lectures
Unit-II:	SOP, POS, Minimisation of Boolean function using K-map method, Quine-McClusky tabulation method,	8 lectures
Unit III:	Combinational circuit design, Half Adder, Full Adder, Multiplexers, Demultiplexers, Encoders, Decoders, Seven segment display, Parity Generators and Checkers, Comparator, ROM, PROM, EPROM, EEPROM, PAL/PLA.	8 lectures
Unit IV:	Analysis of Sequential Circuit, Flip-Flops [RS, D, JK, JK Master Slave], Excitation table, Design procedure for sequential circuits, Register, types of Registers, Asynchronous and Synchronous counters, Decade counter, Presettable Counter, Counter design.	8 lectures
Unit V:	Analysis and design of Asynchronous sequential circuit, Design of Synchronous sequential circuit, Model selection, State Transition diagram, State Synthesis table, Design equations and circuit diagram, Implementation using ROM, Algorithmic State machine, State reduction technique.	10 lectures

Recommended Books:

1. Switching and finite automata theory, ZVIkohavi, Tata McGraw Hill, New Delhi
2. Digital Design M. Morris Mano PHI
3. Digital Principles and Applications, D. P. Leach, A. P Malvino& G. Saha, McGraw Hill
4. Digital Computer Fundamentals, Bartee Tata McGraw Hill

CS 3177 Principles of Computers (AUDIT): 3 Credits (2-0-2)

Unit I	Introduction to Computers - Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Program Development. Digital computer fundamentals: flowcharts, the von Neumann architecture, programs, assembly language, high level programming languages, text editors, operating systems. Introduction to the C Language - Background, C Programs, Identifiers, Types, Variables, Constants, Input / Output, Operators(Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence	6 lectures

	and Associativity, Expression Evaluation, Type conversions, Statements- Selection Statements(making decisions) - if and switch statements, Repetition statements (loops)-while, for, do-while statements, Loop examples, other statements related to looping -break, continue, goto, Simple C Program examples.	
Unit II	Functions-Designing Structured Programs, Functions, user defined functions, inter function communication, Standard functions, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Limitations of recursion, example C programs, Preprocessor commands. Arrays - Concepts, using arrays in C, inter function communication, array applications, two - dimensional arrays, multidimensional arrays	6 lectures
Unit III	Pointers - Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, Pointer Applications-Arrays and Pointers, Pointer Arithmetic and arrays, Passing an array to a function, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions. Strings - Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion.	6 lectures
Unit IV	Enumerated, Structure ,and Union Types- The Type Definition (typedef), Enumerated types, Structures -Declaration, initialization, accessing structures, operations on structures, Complex structures, structures and functions, Passing structures through pointers, self-referential structures, unions, bit fields, C programming examples, command -line arguments.	6 lectures
Unit V	Input and Output - Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input / output functions (standard library input / output functions for files), file status functions (error handling),Positioning functions, C program examples.	4 lectures

Recommended Books:

4. C Programming Absolute Beginner's Guide (3rd Edition) - Greg Perry, Dean Miller, Pearson Education

5. Programming with C, Byron Gottfried, McGraw Hill International, New York, 1996.

6. The C programming Language, Kernighan B W & Ritchie Denison, 2nd Ed., Prentice Hall of India, New Delhi, 1990.

CS 3201 Programming Tools and Techniques:5 Credits (2-0-6)

Unit I	Vim, Emacs, HTML; Report and presentation software: latex	6 lectures
Unit II	Drawing software (e.g. inkscape, xfig); Office suite: openOffice/ libreoffice	6 lectures
Unit III	Unix basics: shell, file system, permissions, process hierarchy, process monitoring, ssh; Unix tools: e.g. awk, sed, grep, find, tar, sort, ls, diff, etc; I/O redirection, pipes; Bash shell scripting.	6 lectures
Unit IV	Python programming: Basic data types-numbers (floating point, complex, and unlimited-length long integers), strings (both ASCII and Unicode), lists, and dictionaries; classes, inheritance, exception handling.	6 lectures
Unit V	Makefile: libraries and linking; Graph plotting software (e.g., gnuplot)	4 lectures

Recommended Books:

1. Unix Man Pages for all unix tools

2. Beginning Linux Programming, 4th edition - Neil Mathew and Richard Stones, Wrox publication.

3. The Python Tutorial Online Book

(http://docs.python.org/3/tutorial/index.html)

4. Latex - A document preparation system, Leslie
   Lamport, 2/e, Addison-Wesley, 1994
5. https://inkscape.org/ and other online tutorials.

CS 4100 Computer Networking Concepts & Devices: 3 Credits (3-0-0)

Unit I	Computer communication fundamentals: network topology - mesh, tree, bus, star, ring; network types - LAN, MAN, WAN; transmission media types- guided and unguided, reference models-OSI/ISO, Layered network architecture.	10 lectures
Unit II	LAN connecting devices - hub, repeater, bridge, switch; internetworking devices - router, gateway; firewall.	8 lectures
Unit III	Wireless networks: satellite systems, cellular systems - GSM, Wi-Fi, WiMax, Mobile Ad hoc networks, Bluetooth, wearable computers.	10 lectures
Unit IV	Mesh networks, Sensor networks, Internet: history, services; www, HTTP; domain name service.	8 lectures
Unit V	Introduction to computer network security, Remote logging, electronic mail, file transfer; network management.	6 lectures

Recommended Books:

1. Data communication and networking, 4thEd.. B. Forouzan, McGrwa-Hill.

2. Computer Network Security, Joseph Migga Kizza, Springer, 2005.

NOTE: The instructor will focus on the application and the general concepts of the above topics.

CS 4101 Data Structures -I: 4 Credits (3-0-2)

Unit I	Arrays, linear search, Binary search, bubble sort, insertion sort, Asymptotic Notations.	7 lectures
Unit II	Stack and Operations, applications of stack: Evaluation of arithmetic expressions, Tower of Hanoi Problem, Implementation of recursion, Quick sort, Queue and operations, Circular queue, Priority queue, Deque, applications of queue	10 lectures
Unit III	Linked list, doubly linked list, Operations on linked lists, stack and queue to be represented by linked list, circular linked list	9 lectures
Unit IV	Hash Functions, Hash Tables, Collision resolution Techniques, Closed and open hashing, perfect hashing	6 lectures
Unit V	Tree: Binary tree, tree traversals, Binary search tree (BST), Operations in BST, Expression tree, AVL tree, Heap tree and heap sort, weighted binary tree, decision trees. More sorting techniques such as selection sort, merge sort, radix sort, bucket sort and a search method : Fibonacci search	10 lectures

Recommended Books:

1. Fundamentals Of Data Structures in C, Horowitz Ellis and S Sahni, Orient Longman, 2008.

2. Data Structures With C, S Lipschutz, TMH, 2011.

3 Classic Data Structures, D Samanta, PHI, 2nd edition, 2009.

4 Data Structures using C AND C++, LangsamYedidyah , Augenstein J Moshe , Tenenbaum M Aaron, PHI, 2nd edition, 2009.

CS 4102 Application Software: 5 Credits (3-0-4)

Unit I	Definition of Application Software, scope, uses and features of Microsoft visual Basic6: Various commands, solving queries, working with forms, menus and reports, control structures, program development in VB6.	4 lectures

Unit II	Microsoft VB.NET : VB.NET Overview, Variable Names, Data Types, Assignment, If-then, if-then-else, if then-elseif-else, expression, print statement, arrays, variable declaration, built-in & User Defined types Subroutine and functions, Boolean Operators, Arithmetic Operator, For-.next, do loop, while-wend, procedures/Public, Private, and Static & Dim Statement.	6 lectures
Unit III	Structure of VB program, Forms & built in controls, Properties and events, Code Module, Scale Modes, Printer Object (Printing text, setting Fonts, graphics) Common dialog Boxes, picture controls, image-controls, send keys, MS-Common controls, Error Handling, Classes, Control Arrays, MDI, SDI. Concept of windows API	6 lectures
Unit IV	Building ActiveX controls and ActiveX components, ODBC, Pass through ODBC, DAO, MS-Jet Engine, DB- Engine, Workspaces, Database programming in VB: recordsets, Data bound controls, ADO, Active X Data controls, RDO.	8 lectures
Unit V	Web application with VB.NET, Multimedia application with VB.NET: animation control, Active Movie control and RealAudio ActiveX control library. Internet transfer controls: concept of client sever interaction and ASP	4 lectures

Recommended Books:

1. Menachem Bazian "Using Visual Foxpro 6", PHI

2. E. Petroutsos,"Mastering Visual Basic 6.0", BPB

3. Soma Dasgupta,"VB.net Made Simple: Programs and Project"

4. Dr. A.Murugan, Dr.K.Shyamala,"Visual Basic Programming".

CS 4103 Computer Organization & Architecture: 5 Credits (3-1-2)

Unit I	Introduction: Evolution of computers, Hierarchical levels of computer system design, Organization and Architecture: Discussion on the different functional blocks.Data Representation: Binary numbers, binary codes, fixed point representation, floating point representation, error detection codes. Introduction to Assembly language, Memory Units, Addressing methods: Memory location, instruction formats, instruction sequencing and Addressing modes.	8 lectures
Unit II	Fundamental concepts of the processing Unit: Fetching and Storing words,Register Transfer, Execution of instruction, hardwired controls and Microoperation: Register transfer language, register transfer, bus and memory transfer, arithmaticmicrooperations, logic microoperations, shift microoperations., Arithmetic Logic shift Unit	8 lectures
Unit III	Computer Organization and Design: Instruction codes, computer registers, computer instructions, timing & control, instruction cycle, memory reference instructions, input- output and interrupts, Microprogrammed Control Unit: Micro instruction, Microprogram sequencing, Input - Output Organization: Different techniques of addressing I/O devices, modes of data transfer, data transfer over synchronous and asynchronous buses, priority interrupt, direct memory access, I/O channel.	9lectures
Unit IV	CPU structure and function: Introduction, general registers organization, stack organization, Memory Organization: Random and serial access memories, Static & dynamic RAMs, ROM, Memory Hierarchies: Cache memories; Mapping function, Replacement Algorithms; Performance consideration; Virtual memory, Memory Management.	9 lectures
Unit V	Introduction to microprogramming level microarchitecture: Conventional machine level instruction format and addressing modes. Basic concepts of pipelining: Instruction Queue, branching, data dependency. Computer Peripherals; Examples of Intel 80X86 processors, Power PC Family, Motorola 680X0 family. Introduction to file system FAT 16, FAT32, NTFS. Disk formatting and partitioning.	8 lectures

Recommended Books:

1. Mano, M "Computer System and Architecture", (3rd edition) Prentice Hall of India,

2. Stallings,W "Computer Organization & Architecture", fifth edition, 2000 PHI.

3. V.CarlHamacher, Z.G. Vranesic and Zaky "Computer Organization", International Edition McGraw Hill.

4. Computer Organization and Architecture Designing for performance, 8th Edition, William Stalling.

5. S. Bigelow , Troubleshooting, Maintaining and Repairing PCs, Melleneum Ed.   , Tata McGraw Hill

6. P.Pal Choudhury " Computer Organization and Design" PHI., New Delhi 1994.Hwang & Briggs " Computer Architecture" International Edition McGraw Hill.

CS 4104 Principles of Programming Language: 3 Credits (3-0-0)

Unit I	Introduction, Brief history of programming language, Criteria for programming language design, Evolution of major Programming languages Concept of low level languages, mid level language, high level languages, Programming environment	8 lectures
Unit II	Syntax and semantics of programming languages, language translation, Context-free grammars, Parse trees, BNF, EBNF, Variables expressions	10 lectures
Unit III	Scope rules, Binding- statics & dynamic binding, type checking procedures, sub programs and functions	8 lectures
Unit IV	Data abstraction, information hiding, Encapsulation, Inheritance, Concurrency polymorphism, Exception handling	8 lectures
Unit V	Basic concept of functional programming language, Object oriented programming languages, Logical programming languages	8 lectures

Recommended Books:

1. Programming Language Pragmatics- Michael L. Scott, Morgan Kaufmann, 2000.

2. Essentials of Programming Languages - Friedman, Wand and Haynes, Prentice-Hall International (PHI), 1998.

3. Principles of Programming Languages-Tennant. PHI, 1981.

CS 4200 Microprocessors: 5 Credits (3-1-2)

Unit I	Introduction to 8085 - 8085 architecture - Pin Details - Addressing Modes -Instruction Set and Assembler Directives - Instruction Timing Diagram - Assembly Language Programming with 8085.	7 Lectures
Unit II	Introduction to 8086/8088-8086/8088 Architecture - Pin Details - Addressing Modes - Instruction Set and Assembler Directives - Assembly Language Programming with 8086/8088-Basic Peripherals and their interfacing with 8086/8088 - Semiconductor Memory interfacing-Dynamic RAM Interfacing.	10 lectures
Unit III	Interrupt of the 8085 Microprocessor -Interrupt of 8086/8087 Microprocessor,Programmable Interrupt Controller 8259A Architecture - Command Words of 8259-Operating modes, Interfacing I/O Ports - PIO 8255 Architecture - Modes of Operation, Programmable Interval Timer 8253 Architecture - Operating modes.	11 lectures
Unit IV	Introduction-Serial Communication Interface 8251, DMA Controller 8237-Architecture-Register organization-DMA Operation, Keyboard and Display I/O Interface 8279 - Architecture-Modes of Operation-Command Words of 8279-CRT Controller 8275- Analog to Digital Interfacing Architecture-Bus Interface-UART 8250.	9 lectures
Unit V	BCD to Binary code conversion, Binary to BCD conversion, BCD to seven-segment LED code conversion, BCD Addition and Subtraction, Introduction to Advanced Instruction and Application, Multiplication and Subtraction with carry.	5 lectures

Recommended Books:

1. Microprocessor Architecture, Programming and Applications with 8085/8080 A, 3rd Ed., R. S. Gaonkar, Wiley Limited, New Delhi, 1997.

2. Introduction to Microprocessors, 3rd Ed., Mathur, Tata McGraw Hill, New Delhi, 1989.

CS 4201 Operating Systems: 3 Credits (3-0-0)

Unit I	**Introduction-**Goals of operating systems,Operating System Structures and operations; Classes of OS- Simple Batch Systems, Multi-programmed Batched System, Time sharing System, Personal Computer Systems; Computer System Operation, System Programs.	6 lectures
Unit II	**Process and Threads-**Concept of process and threads, Multithreading Models, Process Scheduling-CPU Scheduling Criteria and Algorithms, Process Swapping; Process Coordination and Synchronization- The Critical Section Problem and Solutions, Classical problems of Synchronization; Deadlocks: Prevention, Avoidance, Detection and Recovery	10 lectures
Unit III	**Memory Management-**Logical and Physical address space, Address Binding, Contiguous and Non-Contiguous Memory Allocation Techniques-Paging, Segmentation; Virtual Memory Management-Demand Paging, Page Replacement Algorithms,Thrashing	8 lectures
Unit IV	**Storage Management-**File System-File Attributes and Operations, File Structure, Access Types and Methods; Directory Structure, File System Mounting, Basics of File and Directory System Implementation; Disk structure, Disk scheduling, Disk management.	10 lectures
Unit V	I/O Systems-I/O Hardware, Application I/O Interface, Kernel I/O subsystem, System call, Transforming the I/O Request to hardware Operation, Concept of Streams, Comparative Case study of DOS, Windows 9X and Linux operating systems.	8 lectures

Recommended Books:

1. Operating Systems Concepts, 5th Ed., Sibershatz& Galvin, Addison Wesley. New York, 1998.

2. D M Dhamdhere, "Operating Systems : A Concept based Approach", 2nd Edition, TMH.

3. William Stallings, "Operating Systems: Internals and Design Principles", 6th Edition, Pearson Education.

CS 4202 Programming in Java: 4 Credits (3-0- 2)

Unit I	OOP Principles, Overview of Java, data types, variables,dynamic initialization, arrays, operators, control statements, type conversion and casting.	4 lectures
Unit II	General form of a class, creating objects, access control in classes, Constructors, this key word, method overloading, recursive methods, returning objects, static members, final qualifier, nested and inner classes, garbage collection, string handling in Java.	10 lectures
Unit III	Inheritance Basics, super classes and subclasses, the keyword, extends, multilevel hierarchy, method overriding; run time polymorphism, abstract classes and methods, final in inheritance. Packages and Interfaces,access protection, importing classes and packages, defining and implementing interfaces, nested interfaces, use of interfaces, variables in interfaces.	10 lectures
Unit IV	Exception handling: types of exceptions, Built-in exceptions, creating own exception sub classes; Multithreading: differences between process and thread, thread life cycle, creating multiple threads using Thread class, Runnable interface, Synchronization, thread priorities, inter thread communication, daemon threads, deadlocks, thread groups. Java I/O basics, Streams, Console based and File based I/O	10 lectures
Unit V	Applet fundamentals, native methods, static import, the applet class, applet display method, requesting repainting, a banner applet, passing parameters to applets, uses of applets.	8 lectures

Recommended Books:

1. Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI

2. Core Java 2, Vol 1, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education.

3. Core Java 2, Vol 2, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education.

Recommended Books:

1. The Complete Reference Java J2SE, 5th Edition, Herbert Schildt, TMH Publishing Company Ltd, NewDelhi.

2. Big Java 2nd Edition, Cay Horstmann, John Wiley and Sons.

3. Beginning in Java 2, Iver Horton, Wrox Publications.

4. Java, Somasundaram, Jaico.

CS 4203 Data Structures II : 5 Credits (3-1-2)

Unit I	Advanced topics on tree: B Tree, B+ Tree, m-way search tree, 2-3-4 Tree, Red-black tree, Trie tree and operations over all these types of trees	10 lectures
Unit II	Fundamentals of graphs: Undirected graph, directed graph, conceptual terminologies, Graph representation, Graph Algorithms: Breadth first and depth-first search	7 lectures
UnitIII	Minimum Spanning Trees: Kruskal and Prim's algorithms, single-source shortest paths (Bellman-ford and Dijkstra's algorithms), All-pairs shortest paths (Floyd-Warshall Algorithm)	9 lectures
Unit IV	More Topics on graph: Topological sorting, Strongly connected components, matching, bipartite graphs	7 lectures
Unit V	Advanced data structures: Skip list, van Emde Boas Trees, Fibonacii heaps, Disjoint-set operations , Linked-list representation of disjoint sets	9 lectures

Recommended Books:

1. Fundamentals Of Data Structures in C, Horowitz Ellis and S Sahni, Orient Longman, 2008.

2. Data Structures With C, S Lipschutz, TMH, 2011.

3. Introduction to algorithms: T.H. Cormen, C.E. Leiserson, R.L. Rivest, C.Stein 3rd edition, PHI, 2009.

4. Graph Theory, D B West, PHI, 2nd edition, 2009.

5. Classic Data Structures, D Samanta, PHI, 2nd edition, 2009.

6. Data Structures using C AND C++, LangsamYedidyah , Augenstein J Moshe , Tenenbaum M Aaron, PHI, 2nd edition, 2009.

CS 4204 Computer Graphics: 3 Credits (2-0-2)

Unit I	Fundamental of computer graphics, Interactive graphics display, Display devices, Point plotting techniques: Co-ordinate systems, incremental methods, Line drawing algorithms, Circle generators, 2-Dimensional transformations; Transformation Principles: Concatenation and matrix representation.	5 lectures
Unit II	**Clipping and Windowing :** A line clipping algorithm, Midpoint subdivision, Clipping other graphic entities, polygon clipping, viewing transformations, the windowing transformation.	6 lectures
Unit III	Rules for Graphics software design, Graphic primitives, Windowing functions, Example of a graph plotting program; Segments: Posting and Un-posting a segment; Basics of Geometric modeling, Symbols and instances; Picture structure: Symbols by procedure, Display procedures; Principles of event handling.	6 lectures
Unit IV	Raster graphics fundamentals: Generating a raster image, representing a Raster image; Geometric representation of Areas, Scan-conversion algorithm, Moving parts of an image, Raster manipulation functions.	6 lectures
Unit V	Fractal Geometry in graphic design, Initiator, Generator, Chaotic Systems in graphic design, Strange Attractors.	5 lectures

Recommended Books:

1. Principles of Interactive Computer Graphics, 2nd Edition, Newman &Sproull: McGraw Hill International., New York, 2001.

2. Computer Graphics, 2nd Ed., Hearn and Baker, Prentice Hall of India, New Delhi, 2001.

3. Computer Graphics: Principles and Practice (in C), 2nd Ed., J.D. Foley, A. VanDam, SK Feiner, & J.F. Hughes, AWL Publication, New York, 2000.

CS 4400 Programming with C++ : 4Credits (3-0-2)

Unit I	Overviews of C, Procedural Vs Object Oriented Programming(OOP), characteristics of OOP, Variables, constants, operators in C++, Functions: Function Prototyping, Call by reference, Call by Value, Return by Reference, Inline Function, Namespace in C++, Classes and Objects, Scope resolution operator, public, private access specifier, Object instantiation, array of objects, passing objects to member functions, this pointer	8 lectures
Unit II	Constructors, Default Constructor, Parameterized Constructors, Dynamic memory allocation using new,delete, Destructors, Friend Functions/Classes Copy Constructors, Usage of reference (&) variables, Introduction to overloading, Constructor overloading, Function overloading, Operator overloading, unary operator overloading, Binary operator overloading, Use of friend function in operator overloading	8 lectures
Unit III	String manipulation using operators. Introduction to Inheritance, Base pointers, virtual base classes, Abstract classes, Constructors in Derived classes, Types of inheritance, Nesting of classes, Pointers, Pointer to Object Pointer to Derived class, Virtual Function, Pure Virtual Function, Run-time Type Polymorphism, Compile-time type polymorphism	10 lectures
Unit IV	Streams classes, Disk File I/O with streams, File pointers, Error handling in File I/O with member functions, Memory as a stream object, Command Line arguments, Printer output, Introduction to templates, Function Templates, Class templates Exceptions	8 lectures
Unit V	Introduction to STL, Containers, Algorithms, Iterators, Specialised Iterators Associative Containers, Sequence Containers,Function Objects	8 lectures

Recommended Books:

1. Stephen Prata, "C++ Primer Plus", Sixth Edition, Pearson, 2012

2. S. B. Lippman& J. Lajoie, "C++ Primer", 5th Edition, Addison Wesley, 2012.

3. Bjarne Stroustrup, "The C++ Programming Language", 4th Edition, Pearson, 2013.

CS 4000 Data Processing and File System: 4 Credits (3-0-2)

Unit I	Basic file concepts, entities, attributes, records, keys, organized data, primitive data types; Physical devices: tapes, magnetic disks, storage characteristics; blocking, deblocking, buffering. Types of data file and terminology.	6 lectures
Unit II	Data management: collection, classification, clustering, sorting, searching, retrieval, maintenance, verification/validation, transcription, duplication, coding, editing, transmissions, data management objects and guideline.	7 lectures
Unit III	Responsibilities of File system, file organization, Flie organization techniques: sequential file, direct access file, indexed sequential, multi-indexed, inverted and multilist files; choice and design of record formats, physical records, logical records, batch processing of files, sorting and merging; hashed files: Functions, algorithm for synonymous -rehashing, collision avoidance, linear probing, chaining.	9 lectures
Unit IV	Data processing using COBOL, COBOL literals, variables,constants, commands, verbs, clauses; tables; Iteration and looping in COBOl; procedures.	10 lectures
Unit V	File processing in COBOL, creating and manipulating all kind of files; report generation.	10 lectures

Recommended Books:

1. Theory and Problem of COBOL Programming, Roy, Ghosh, Dastidar, TMH, 2001

2. Introduction to data structure with application, Trembley& Sorenson, TMH, 2001

CS 4001 Web Technology: 4 Credits (3-0-2)

Unit I	Internet & Web: History and growth of Internet and Web, Introduction to WWW, Web Browsers and Search Engines, Internet protocols and applications, overview of various internet & web technologies, cyber laws. Web Design: Key issues and challenges .	4 lectures
Unit II	**HTML :** Introduction to HTML, Elements of HTML syntax, Head and Body sections, Building HTML documents, Inserting text, images, hyperlinks, Backgrounds and Color Control, ordered and unordered lists, content layout & presentation. Tables: Creating Tables, use of table tags and various other HTML tags, **Introduction to CSS :** Creating Style Sheets, Common **Tasks with CSS.Frames:** Developing Web pages using frames. Security: Considering various security issues like firewalls etc. Introduction to JavaScript and JQuery.	12 lectures
Unit III	PHP: Introduction to PHP, Handling HTML forms with PHP, Decisions and Loops, Functions, Strings, Arrays, Working with Files and Directories, Server-side technologies emphasizing implementations in PHP.	12 lectures
Unit IV	Database Connectivity with MySql: Introduction to RDBMS, connection with MySql database, Performing basic database operation(Insert, Delete, Update, Select), Setting query parameter, executing query	8 lectures
Unit V	**Web Designing :** Creating interactive & dynamic web pages, DHTML, Creating forms, VB Scripts, CGI using PERL, ASP. **Web Technologies:** Current web technologies and their applications.	6 lectures

Recommended Books:

1. Achyut S Godbole and AtulKahate, "Web Technologies", Tata McGraw Hill

2. C. Xavier, "Web Technology & Design ", Tata McGraw Hill.

3. Ann Navarro, " Effective Web Design", BPB publications.

4. Raj Kamal, "Internet & Web Design", Tata McGraw Hill

5. E Stephen,Will Train, "HTML 4.0", BPB publication

Recommended References:

1. VK Jain, "Advanced programming in web design", Cyber tech Publications

2. Rick Dranell, "HTML4 unleashed", Techmedia Publication.

CS 4002 Graphics Design and Modelling: 4 Credits (3-0-2)

Unit I	Graphics basics, introduction, Graphics output device, Raster scan Graphics, Graphics programming & OpenGL	06 lectures
Unit II	Modeling Transformation, Clipping, Hidden line/surface elimination, Hierarchical modeling, Viewing, scan conversion, Computer-aided drafting, Parametric drafting, Projections, Viewing Cameras, Projection Matrices, Parallel Projections, Perspective Projections	10 lectures
Unit III	Modeling, Polygonal meshes, Curves & Surfaces, Models Other Material Hierarchical Models, Language Models, Physical Models, Particle Systems Web Based Models, Solid Modeling, Constructive Solid Geometry (CSG)	10 lectures

Unit IV	Rendering, Rendering basics, Hidden surface removal, Illumination and shading, Texture mapping	08 lectures
Unit V	Animation, Animation basics, Key-frame animation, Graphics Standards: 2D and 3D standards, Graphics portability	08 lectures

Recommended Books:

1. Interactive Computer Graphics: A Top-Down Approch using OpenGL
   - E. Angel , 4th ed., Addison-Wesley, 2006

2. Computer Graphics with Open GL
   - D. Hearn and M. Baker, 3rd ed. Prentice Hall,2003

CS 4003 REAL TIME SYSTEMS : 4 Credits (3-1-0)

Unit I	**Introduction-**Application of Real Time Systems, Basic Model of a Real Time System, Characteristics of Real Time Systems, Issues in Real Time Computing, Task classes, Timing Constraints, Modeling Timing Constraints,Safety and reliability	6 lectures
Unit II	**Real time task scheduling**-Classical Uniprocessor Scheduling Algorithms, Handling Resource Sharing and Dependencies among Real Time Tasks, Scheduling Real Time Tasks in Multiprocessor and Distributed Systems; Task Allocation, Fault Tolerant Scheduling and Clock Synchronization	12 lectures
Unit III	**Real time communication-**Example of Real Time Communication, Communication Media, Network Topologies, Soft and Hard Real Time Communication in a LAN, Protocols, Fault Tolerant Routing, Fault Tolerance Techniques- fault types, fault detection. Fault error containment redundancy, data diversity, reversal checks, Integrated failure handling	8 lectures
Unit IV	**Real time databases**-Applications of Real Time Databases, basic definition, real time Vs general purpose databases, main memory databases, transaction priorities, transaction aborts, concurrency control issues and protocols, disk scheduling algorithms, two phase approach to improve predictability, maintaining serialization consistency, databases for hard real time systems	10 lectures
Unit V	**Real time operating systems(RTOS)**-Featuresof Real Timeoperating System, Types of Real Time Operating systems, Operating System Designs, RTOS for Safety Critical Systems, Case Studies- UNIX and Windows as RTOS	6 lectures

Recommended Books:

1 Rajib Mall, "Real-Time Systems: Theory and Practice," Pearson, 2008.

2. Krishna and Shin, "Real-Time Systems," Tata McGraw Hill. 1999

3. W. Ecker, W. Muller and R. Domer, "Hardware-dependent Software: Principles and Practice", Springer, 2009.

4. C.M.Krishna, Kang G. Shin, "Real-Time Systems", McGraw-Hill International, 97

ES 3100 Object Oriented Programming with C++: 4 Credits (2-0-4)

Unit I	Overviews of C, Procedural Vs Object Oriented Programming(OOP), characteristics of OOP, Variables, constants, operators in C++, Functions: Function Prototyping, Call by reference, Call by Value, Return by Reference, Inline Function, Constant Arguments, Function Overloading	6 lectures
Unit II	Classes & Objects, Arrays within a Class, Memory Allocation for Objects, Static Data Members, Static Member Functions, Arrays of Objects, Object as Function Arguments, Friend Functions, friend classes, Returning Objects, Constant member functions, Pointer to members, Constructor :Parameterized Constructor, Multiple Constructor in a Class, Constructors with Default Arguments, Dynamic Initialization of Objects, Copy Constructor, Dynamic constructor, Destructor and its uses.	8 lectures

Unit III	Operator Overloading: Defining operator Overloading Overloading Unary, binary Operators, Overloading Binary Operator Using Friends, Manipulating of String Using Operators; Type Conversion details; Inheritance: Single, Multilevel, Hierarchical, Multiple, Hybrid Inheritance, Virtual Base Classes, Abstract Classes, Constructor in Derived Classes, Nesting of Classes.	10 lectures
Unit IV	Pointers, Pointer to Object, This pointer, Pointer to Derived Class, Virtual Function, Pure Virtual Function, Polymorphism implementations. Working with files, Command Line Arguments.	10 lectures
Unit V	Templates; Exception handling; Introduction to standard library; Namespace.	8 lectures

Recommended Books:

1. E. Balaguruswamy, "Objected Oriented Programming with C++", TMH.
2. A. R. Venugopal , Rajkumar, T. Ravishankar, "Mastering C++",TMH.

ES 4377 Comprehensive Programming with C/C++: 4 Credits (2-0-4)

Unit I	Introduction to algorithm and Programming languages : Algorithm, Features of algorithm (Sequence, Decision and Repetition), Flow Charts(Significance, Advantages and limitations), Pseudo code, Generation of programming languages(Machine , Assembly and High level languages), Basic concept of Compiler, Interpreter and Assembler	3 lectures
Unit II	Introduction to C, Structure of a C program, Files used in C program(Source, Header, Object and Executable file), C-tokens, data types in C, types of variables, Input/output statements, operators in C, type casting and type conversion , Decision control & looping statements.	12 lectures
Unit III	Introduction to C Functions (Function Declaration, Call and definition), Passing parameter to the function (call by value, call by reference) , Recursive Function, Array(Declaration of Array, Storing Values in Arrays, 1D Array Vs 2D Array) , Basic concept of String and String Manipulation Functions , Fundamental Concept of Pointer.	10 lectures
Unit IV	Principles of Object Oriented Programming, Data Types, Structure of C++ program, Operators in C++, Function in C++ (Main Function, Call by reference , Call by value, Return by reference, Inline function , Friend Function and Function overloading)	7 lectures
Unit V	Objects and Classes, Encapsulation, Constructors and Destructor, Inheritance	10 lectures

Recommended Books:

1. Programming in ANSI C, Balaguruswamy, Tata McGraw Hill, New Delhi, 1997.
2. Programming with C, Byron Gottfried, McGraw Hill International, New York, 1996.
3. The C programming Language, Kernighan B W & Ritchie Denison, 2nd Ed., Prentice Hall of India.
4. Object Oriented Programming in TURBO C++, Robert Lafore, Galgotia Publications, New Delhi, 1991.

Department of Electrical Engineering
Programme: Diploma in Electrical Engineering

Year: First   **Semester: First**

Sl. No.	Course Code	Course Title	L	T	P	Cr
1.	HS 3101+	Communication Skill	2	0	2	3
2.	PH 3101 +	Physics - IIIA	4	0	2	5
3.	CY 3101+	Chemistry- III	3	0	2	4
4.	ES 3100	Object Oriented Programming With C++	2	0	4	4
5.	MA 3101	Engineering Mathematics-I	3	1	0	4
6.	EE 3103	Electrical Engineering Materials	3	0	0	3
7.	EE 3101*	Basics of Electrical & E;ectronics Engineering	4	0	2	5
8.	EE 3102*	Electrical Installation and Practice	2	0	2	3
9.	ES 3101*	Applied Mechanics	3	1	0	4
10.	CE 3151*	Engineering Graphics	0	0	4	2
					Total: 23+/26*	

+ For 10+2 Vocational / NERIST Certificates.
*Bridge for 10+2 PCM.

Year: First   **Semester: Second**

Sl. No.	Course Code	Course Title	L	T	P	Cr
1.	ES 3200	Environment And Ecology	3	0	0	3
2.	CY 3201	Engineering Chemistry -I	3	0	2	4
3.	MA 3201	Engineering Mathematics-II	3	1	0	4
4.	EE 3201	Electrical Circuits	3	1	2	5
5.	EE 3202	Generation, Transmission and Distribution	3	1	2	5
6.	EC 3221	Basic Electronics Circuit and Devices -I	3	0	2	4
7.	ME 3277*	Comprehensive Workshop - II(Audit)	0	0	6	3
					Total: 25+3	

* Bridge for 10+2 PCM.

Year: Second   **Semester: First**

Sl. No.	Course Code	Course Title	L	T	P	Cr
1.	HS 4101	Principle of Economics	3	0	0	3
2.	EE 4101	Electrical Machine -I	3	0	2	4
3.	EE 4102	Power System Switchgear and Protection	3	1	2	5
4.	EE 4103	Electrical Estimating and Costing	3	0	2	4
5.	EE 4104	Digital Electronics	3	0	2	4
6.	EE 4105	Electrical Measurements and Instrumentations	3	0	2	4
7.	EC 4121	Electronics Circuits and Devices -II	3	0	2	4
					Total: 28	

Courses Offered to Other Departments

Sl. No.	Course Code	Course Title	Offered to	L	T	P	Cr
1.	EE 4121	Fundamentals of Electrical Engineering	ECE	3	0	2	4
2.	EE 4122		ME				
3.	EE 4123		AE				

Year: Second   **Semester: Second**

Sl. No.	Course Code	Course Title	L	T	P	Cr
1.	EE 4201	Electrical Machine-II	3	0	2	4
2.	EE 4202	Signals and Systems	3	1	0	4
3.	EE 4203	Electrical Power Utilization	3	0	2	4
4.	EE 4204	Power Electronics-I	3	0	2	4
5.	EE 400*	Elective	3	0/1	2/0	4
6.	EE 4299	Project	0	0	6	3
7.	ED 4288	Extra Curricular Activities And Discipline	0	0	0	2
					Total: 25	

List of Electives

Sl. No.	Course Code	Course Title	L	T	P	Cr
1.	EE 4001	Switched Mode Power Supply Systems	3	0	2	4
2.	EE 4002	Instrumentation	3	0	2	4
3.	EE 4003	Fundamentals of Microprocessors	3	0	2	4
4.	EE 4004	Illumination Engineering	3	1	0	4
5.	EE 4005	Rural Electrification and Utility of Solar PV	3	0	2	4

EE 3101   Basics of Electrical and Electronics Engineering : 5 Credits   (4-0-2)

Unit-I	Electromagnetic Laws: Lorenz Law, Ampere's Law, Faraday's law or electromagneticinduction, Right hand screw Rules, Left hand Rule, Lenz's law, Magnetic coupling, Self and Mutual Inductance, Electromagnetic torque and its general equation.	12 lectures
Unit-II	AC fundamentals: Cycle, Phase, Frequency, Time Period, Average values, RMS value, Form factor, Peak factor, Production of single phase AC voltage, current and voltage relationship for resistive, inductive and capacitive circuits, single phase and three-phase circuit, Star-Delta transformation, Relationship between phase and line quantities.	14 lectues
Unit-III	Electrical Machines: Classification of Electrical Machines; Basic concept of DC, synchronous and induction machine, construction only, single phase and three-phase transformers.	12 lectures
Unit-IV	Semiconductor devices, diodes, rectifiers circuits, transistor and its application, introduction to amplifiers, Controlled rectifier, characteristics, triggering circuits, basics of oscillators.	10 lectures
Unit-V	Basic principles of electrical supply systems, Importance of energy storage devices, Basic principles of UPS and its applications.	8 lectues
		Total lectures 56

Recommended Books:

1. A text book of Electrical Technology Volume-I by B. L. Thereja, S. Chand Publications
2. Networks and System by D. Roy Chaudhury, New Age International.
3. Electrical Machinery by P. S. Bimbhara, Khanna publisher.
4. Basic Electronics by Malvino A.P.., McGraw Hill

EE 3102   Electrical Installation and Practice : 3 Credits (2-0-2)

Unit-I	Generations: Introduction, classifications, advantages and disadvantages n site selection, working principle, layout and main components of diesel, Thermal, hydro and Nuclear Power plants. Non-Conventional power plants.	6 lectures
Unit-II	Substation Practices: Introduction, Types of substations, H.T & L.T metering, safety requirements Electrical diagrams, electrical symbols relevant to substations, various arrangements of bus bars, isolating switches, CT, PT, circuit breakers, lighting Arrestors, power transformer and their parts. Substation earthling, protective measures as per relevant IE rules.	6 lectures
Unit-III	Study of layout diagrams, single line representation of pole mounted distribution substation and 11/0.415kVA, foundation mounted substations. Study of control panels, types of relays and their testing.	5 lectures
Unit-IV	Transmission and Distribution lines: Overhead lines, types of poles and their construction, Mechanical design of overhead lines, overhead line conductors, Insulators, stays, Guarding wires, Anti-climbing devices etc. Under Ground cables, types of cables, factors determining selection of LT power cables. Advantages and disadvantages in comparison to overhead lines, constructional details of cables, laying of underground cables and its terminations, consumer service connections, cable fault location, maintenance.	6 lectures
Unit-V	Campus Lighting: Terminology of Illumination, laws of illuminations, Street lighting, various types of Light sources and design considerations of good lighting scheme and service feeder pillar.	5 lectures
		Total lectures 28

Recommended Books:

1. Electrical substation engineering and practices, by S.Rao, Khanna Publication, Delhi 1992
2. Electrical Power by S.L Uppal, Khanna Publishing, Delhi 1996
3. Electrical Design Estimating and Costing by K.B Raina, S.K Bhattacharya, Wiley Eastern Limited, New Delhi, 2003
4. Non-Conventional Energy Resources by D.S Chauhan & S.K Srivastava, New Age Publishers, New Delhi, 2005

EE 3103	Electrical Engineering Materials : 3 Credits (3-0-0)	
Unit I	Common crystal structures and their properties in terms of unit cell, Miller Indices, Miller-Bravis indices. Classification: conducting, semi conducting and insulating materials through a brief reference to their atomic structures and energy bands.	9 lectures
Unit II	Conducting materials: Atomic structure, Composition & Application of conducting material, Effect of temperature on resistivity, Properties & uses of Nickels, Properties & uses of Manganese, Properties & uses of Carbon, Properties & uses of Graphite, Metals & alloys for fuses, Properties & specification of wire, cable etc.	9 lectures
Unit III	Insulating materials: Electrical, Thermal & Mechanical Properties of various insulating materials, Transformer oil, quartz etc., Polarization & Dielectric constant, Dielectric properties in alternating fields.	9 lectures
Unit IV	Magnetic Materials: Classification of magnetic materials, Diamagnetism, Para-magnetism, ferro & anti-ferromagnetism, Weiss field & magnetic domains, Magnetic energy, Hard & Soft magnetic materials, Types & uses, B-H curve & Hysteresis Loss.	6 lectures
Unit V	Semi conducting materials: Classifications and properties; Special materials, classification, Properties & uses of ceramic materials, , Contact materials, Chemicals used for cleaning the contact, Introduction to super conductors, types & their applications	9 lectures
	Total lectures 42	

Recommended Books:

1. Electrical Engineering Materials by A.J. Dekker, PHI.

2. Materials and Devices for Electrical Engineers and Physicists, by R.A. Colclaser, S.D. Nagle, McGraw Hill.

3. An Introduction to Electrical Engineering Materials by C. S. Indulkar and S. Thiruveugadam,, S. Chand

4. A text book of Electrical Engineering Materials by P. L. Kapoor, Khanna Pub.

EE 3201	Electrical Circuits : 5 Credits (3-1-2)	
Unit-I	Kirchhoff's Laws & its direct applications, circuit elements & its behaviour with AC & DC supply, network analysis (nodal analysis & mesh analysis), Star/Delta transformations	8 lectures
Unit-II	Network theorems: Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum power transfer theorem etc.	8 lectures
Unit-III	Series AC Circuit: RL, RC, & RLC circuits, phasors & phasor algebra, resonance in series circuit	5 lectures
Unit-IV	Parallel AC Circuit: RL, RC, & RLC circuits, phasor diagrams, resonance in parallel circuit	5 lectures
Unit-V	Transients in DC Circuits, Transients in AC Circuits, Polyphase Circuits, Two-port Networks	16lectures
	Total Lectures 42	

Recommended Books:

1. Theory and Problems of Electric Networks by B.R. Gupta, S. Chand Publications

2. Networks and Systems by D. Roy Choudhury, New Age International

3. Problems in Electrical Engineering by Parker Smith, CBS Publication.

4. Electric Circuits, Shaum Series.

EE 3202	Generation, Transmission and Distribution : 5 Credits (3-1-2)	
Unit-I	Hydro Electric Station. Thermal power station. Nuclear power station. Diesel electric station. Solar and wind power generation systems. Hybrid generation systems. Cogeneration systems. Basics of different types of electric generators.	10 lectures
Unit-II	Performance of the transmission lines: performance of the short, medium and long transmission lines, voltage regulation, corona effect, Ferranti effect.	10 lectures
Unit-III	Mechanical Design of overhead lines. Underground cables. Common types of cable faults. Line insulators.	10 lectures

Unit -IV	Distribution systems: AC distribution system, DC distribution system.Introduction to rural electrification. Concept of power theft and its solution.	10 lectures
Unit -V	The Indian Electricity Rules 1956 for generation, transmission and distribution systems.	2 lectures
	Total lectures 42	

Recommended Books:

1. Generation, Distribution and Utilization of Electrical Energy, by C.L, Wadhwa, New Age Inter.
2. Electrical Power System by Stevension.
3. Electrical Power Generation, Distribution and Utilization by Soni, Gupta and Bhatnagar, Dhanpat Rai & Sons.

EE 4101   Electrical Machine-I : 4 Credits   (3-0-2)

Unit-I	Magnetic circuit concepts: Different types of magnetic materials, permeability, flux density, magnetic field intensity, magneto-motive force, reluctance etc.	4 lectures
Unit-II	Electromechanical Energy Conversions: Elementary concepts of electrical machines, classifi-cations, its common features, basics principles of generator & motor, torque due to non-alignment of two magnetic fields, EMF induced in a coil rotating in a magnetic field.	10 lectures
Unit-III	DC Machines: Constructional features and working principle of DC machine as a generator and a motor; Types DC machines; EMF equation of generator, building up of emf, relation between EMF induced and terminal voltage enumerating the brush drop. The concept of armature reaction, inter poles; Back EMF and its significance, analogy of back EMF with armature reaction, torque equation; Types of D.C. motors, characteristics and applications.	12 lectures
Unit -IV	DC Motor Starters. Conventional methods for speed control of DC motor.	6 lectures
Unit -V	Transformers: Introduction, constructional details and working principle, emf equations, phasor diagrams, equivalent circuits, losses, efficiency and condition for maximum efficiency, rating of the transformers, autotransformers & its applications, parallel operation of transformers, 3-phase transformers, instrument transformers.	10 lectures
	Total lectures 42	

Recommended Books:

1. Electric Machinery, by Fitzgerald, Kingsley and Umans, TMH, 2003.
2. Introduction to Electrical Machines and Transformers, by Guru & Hiziroglu, OXFORD, 2008.
3. Electrical Machines, by C. I. Hubert, Pearson Education, 2007.

EE 4102   Power System Switchgear and Protection : 5 Credits   (3-1-2)

Unit-I	Causes and consequences of high currents, Basics of per unit systems, single line diagram, introduction to symmetrical components and symmetrical and unsymmetrical faults.	8 lectures
Unit-II	Characteristics of relay, primary and back-up protection, Methods of discrimination: time and current grading, Relays: classification basic working principle of electromagnetic and induction relay.	6 lctures
Unit-III	Basic principles of over current relays, directional relays, distance relays, differential relay, their types, characteristics, torque equation. Introduction to static relays. Application and phase comparator	8 lectures
Unit-IV	Neutral Grounding-definition and difference from equipment grounding, disadvantages of neutral ungrounded system, types of neutral grounding, criterion for neutral grounding practice, Earthing Transformer	8 lectures
Unit-V	Apparatus protection: transformer protection, motor protection, alternator protection, Circuit breakers: construction, working principle, arc interruption theory, transient recovery voltage, RRRV, current chopping, auto reclosing, types of CB and its relative advantages and disadvantages	12lectures

Recommended Books:
1. Switchgear and Protection in power system, by Sunil S. Rao, Khanna publishers, Delhi.
2. Power System Protection and Switchgear, by B. Ravindranath and M. Chander, NAI, New Delhi.
3. Power System Protection and Switchgear', by Badri Ram and Vishwakarma, D.N., TMH, 1995.
4. The Art and Science of Protective Relaying, by C Russel Mason, Wiley Eastern Ltd., New Delhi.

EE 4103   Electrical Estimation and Costing : 4 Credits   (3-0-2)

Unit-I	Estimating and its purpose, procedure of estimating plan and specification, electrical schedule, types of load, wiring plan, size of cable, sub-circuits, material estimation labour calculation, estimating form, overhead charges, profit, method of estimating. Purchase system, catalogue, market survey, tenders, comparative statement, order for supply, payment of bills.	9 lectures
Unit-II	Estimating and costing of domestic installation: relevant IE Rules and symbols for domestic installation. CTS wiring of a room, cleat/casing capping wiring in a house, conduit wiring of building; dining hall, institute hall, hospital etc. with appropriate drawing; estimating of industrial installation: IE Rules and symbols and chart notes on house wiring, determination of rating of cable, fuse, switches, starter.	9 lectures
Unit-III	Estimating with appropriate drawing of installation of plan, single-line representation, wiring diagram of workshop, mills, pumping stations; Earthing: relevant IE and IS Rules, determination of size of earth wire and earth plate for domestic and motor installation.	6 lectures
Unit-IV	Drawing and estimation of different types of earthing, Transmission and distribution (OH and UG), IS and IE Rules, planning and designing of lines with different kinds of fixtures, earthing etc. Estimating and drawing of LT lines on unit basis; estimating and drawing of HTOH lines, estimating and drawing of HTUG cable.	9 lectures
Unit-V	Design and estimation of street lighting (both OH. and UG system); electrification, design, drawing and estimating of a locality (outdoor); service connections (OH and UG): methods of installation of service lines IE Rules, drawing and estimating of materials required for giving connection to domestic and industrial consumers, substations: types of substation schemes and components, IS and IE Rules, design, drawing and estimating of single, double pole, pole mounted transformer substation for a giving load, indoor Substation-layout and drawing with panels and estimating.	9 lectures
	Total lectures 42	

Recommended Books:
1. Electrical Estimating & Costing by K.B. Raina, TMH Publication.
2. Electrical Design, Estimating and Costing by K. B. Raina & S.K. Bhattacharjee, New Age International Publication.
3. Electrical Specification for Building Construction by J.E. Traise (Prentice Hall
4. Business correspondence and Report Writing by R.C. Sharma and Krishna Mohan, TMH

EE 4104   Digital Electronics : 4 Ctedits   (3-0-2)

Unit-I	Fundamental concepts on analog and digital signals; Introduction to Logic gates, Symbols, operations and truth tables of AND, OR, NAND, NOR, EX-OR & EX-NOR gates; Merits & demerits of universal logic gates, realization of basic gates using universal logic gates.	4 lectures
Unit-II	Introduction to Boolean algebra and K-map; Introduction to sum of product and product of sum logic equations- their simplifications and logic circuit implementations using basic and universal logic gates separately; Number systems and their conversions.	10 lectures
Unit-III	Digital logic and logic families; Representation and reduction technique of logic functions using Boolean algebra and K-map; Introduction to combinational and sequential logic circuits.	10 lectures

Unit-IV	Design of combinational logic circuits, Multiplexer, De-multiplexer, Decoder, Encoder, Comparator etc. using basic logic gates and universal logic gates separately, implementation the same circuits using relevant IC chips.	8 lectures
Unit-V	Design of sequential logic circuits, Introduction to Flip flops, classifications and working principles of flip flops, design of different types of flip flops using universal logic gates; clocked circuits, design of counters (Asynchronous & Synchronous); timing circuits-application of logic gates and op-amp in timing circuits; Design of ADC and DAC circuits, Registers.	10 lectures
	Total lectures	**42**

Recommended Books:

1. Digital Principles and Applications, by A. P. Malvino and D. P. Leach, TMH, New Delhi, 1997.
2. Digital Logic and Computer Design, by M. Morris Mano, PHI, New Delhi, 1998.
3. Modern Digital Electronics, by R. P Jain, Tata McGraw Hill Publishing Co. Ltd., 2003.
4. Electronic Circuit Design Ideas, by B. Laxminarayanan, Asian Book (P) Ltd. International, Singapore.

EE 4105   Electrical Measurements and Instrumentation : 4 Credits   (3-0-2)

Unit-I	**Introduction to measurement system:** Introduction, types of measurement, instruments, error in measurement, Types of error corrections. Measurement of resistance: Types of resistance, low, medium and high - Measurement of medium resistance by V-I method.	8 lectures
Unit-II	Wheat stone Bridge, Sensitivity of stone Bridges.-Difficulty in measurement of high resistance, Methods for measurement of High Resistance, Loss of charge method, Measurement of insulation resistance.	6 lectures
Unit-III	**Measurement of inductance**: Measurement of self inductance by- Maxwell's Inductance capacitance bridge, Hay's bridge, Owen's Bridge. Measurement of mutual inductance self inductance.	9 lectures
Unit-IV	Measurement of capacitance by Schering Bridge, Measurement of relative permittivity. Measurement of frequency, Wein's Bridge method, Types of frequency meters, Electrical resonance type, Weston frequency meter.	9 lectures
Unit-V	Measurement of power factor: Single-phase Electro dynamometer type power factor meter 3-phase Electrodynamometer type PF meter. Potentiometer: Basic Potentiometer circuit, Types of Potentiometer, Crompton type, Standardization of Calibration and application.	10 lectures
	Total lectures	**42**

Recommended Books:

1. A course in Electrical and Electronics Meas. and Instrumentation, by A.K. Sawhney, Dhanpat Rai and Sons.
2. Advanced Electrical Technology by H. Cotton, Wheeler Publication.
3. Electrical Measurement by E.W. Golding.

EE 4121   Fundamentals of Electrical Engineering (for students of ECE): 4 Credits   (3-0-2)

Unit-I	Introduction to circuit elements- resistance, capacitance and inductance and their behaviour with ac and dc; different types of sources and equivalent conversions, test signals, circuit analysis.	6 lectures
Unit-II	Transformer: principle of operation, types, emf equation, losses, efficiency and regulation, autotransformer.	6 lectures
Unit-III	Measuring instruments: moving iron and moving coil meters, volt meter, ammeter, principle of operation, construction, extension of range; watt meter; energy meter.	10 lectures
Unit-IV	Electro-mechanical energy conversion: torque; rotating magnetic fields; dc machines: types, construction; motor and generator action; voltage and speed regulation.	10 lectures

Unit-V	AC machines: alternators; three-phase induction motor; single phase induction motors; power factor improvements.	10 lectures
	Total lectures	**42**

Recommended Books:

1. Electric Circuits by J. A. Edminister, Tata McGraw Hill, New Delhi.
2. Networks & Systems by D. Roy Chaudhury, New age International.
3. Electrical Machines by P.S. Bimbhara, Khanna Publishers.
4. Problems in Electrical Engineering by Parker Smith, CBS Publication.

EE 4122   Fundamentals of Electrical Engineering (for students of ME) : 4 Credits   (3-0-2)

Unit-I	Introduction to circuit elements- resistance, capacitance and inductance and their behaviour with ac and dc; different types of sources and equivalent conversions, test signals, circuit analysis.	6 lectures
Unit-II	Transformer: principle of operation, types, emf equation, losses, efficiency and regulation, autotransformer.	6 lectures
Unit-III	Measuring instruments: moving iron and moving coil meters, volt meter, ammeter, principle of operation, construction, extension of range; watt meter; energy meter.	10 lectures
Unit-IV	Electro-mechanical energy conversion: torque; rotating magnetic fields; dc machines: types, construction; motor and generator action; voltage and speed regulation.	10 lectures
Unit-V	AC machines: alternators; three-phase induction motor; single phase induction motors; power factor improvements.	10 lectures
	Total lectures	**42**

Recommended Books:

1. Electric Circuits by J. A. Edminister, Tata McGraw Hill, New Delhi.
2. Networks & Systems by D. Roy Chaudhury, New age International.
3. Electrical Machines by P.S. Bimbhara, Khanna Publishers.
4. Problems in Electrical Engineering by Parker Smith, CBS Publication.

EE 4123   Fundamentals of Electrical Engineering (for students of AE) : 4 Credits   (3-0-2)

Unit-I	Introduction to circuit elements- resistance, capacitance and inductance and their behaviour with ac and dc; different types of sources and equivalent conversions, test signals, circuit analysis.	6 lectures
Unit-II	Transformer: principle of operation, types, emf equation, losses, efficiency and regulation, autotransformer.	6 lectures
Unit-III	Measuring instruments: moving iron and moving coil meters, volt meter, ammeter, principle of operation, construction, extension of range; watt meter; energy meter.	10 lectures
Unit-IV	Electro-mechanical energy conversion: torque; rotating magnetic fields; dc machines: types, construction; motor and generator action; voltage and speed regulation; ac machines: alter-nators; three-phase induction motor; single phase induction motors; power factor improvements.	10 lectures
Unit-V	Scenario of rural electrification in India; electrical load optimization, voltage regulation, load factor, diversity factor; importance of rural electrification, types and management of electrical loads, importance of renewable energy for augmentation of rural electrification.	10 lectures
	Total lectures	**42**

Recommended Books:

1. Electric Circuits by J. A. Edminister, Tata McGraw Hill, New Delhi.
2. Networks & Systems by D. Roy Chaudhury, New age International.

3. Electrical Machines by P.S. Bimbhara, Khanna Publishers.
4. Problems in Electrical Engineering by Parker Smith, CBS Publication.
5. Rural Electrification: Strategies for Distributed Generation by Hisham Zerriffi, Springer; 2011 edition.

EE 4201   Electrical Machine-II : 4 Credits   (3-0-2)

Unit-I	Three phase induction machine: construction, principles of operation, production of rotating field flux and mmf phasors, rotor frequency, rotor emf, current and power; losses and efficiency; phasor diagram; equivalent circuit; torque-slip characteristics; power-slip characteristics; operating characteristics of induction motors, induction motor stability; starting and speed control of three phase induction motors.	10 lectures
Unit-II	Induction generator: working principle, equivalent circuits, types of excitation, single phase and three phase operation.	6 lectures
Unit-III	Three phase synchronous machine: construction and excitation system; types of synchronous generators; three phase winding; synchronous speed and frequency; emf equation; phasor diagram and equivalent circuit; armature reaction; voltage regulation; power transfer equation; parallel operation of alternator; infinite busbar; load sharing; salient pole synchronous generators; synchronous motors; starting, constant speed operation; phasor diagram, equivalent circuit of synchronous motors; V-curves; speed control of synchronous motor.	10 lectures
Unit-IV	Single phase induction motors; cross field and double revolving field theory; starting and operating characteristics; performance equations; applications.	8 lectures
Unit-V	Applications of three phase induction motors, synchronous motors in industries; applications induction generators in wind and micro-hydel power generating stations; synchronous condensers and synchronous phase modifiers for industrial applications.	8 lectures
	Total lectures	**42**

Recommended Books:

1. Electrical Machinery, by Fitzerald, Tata McGraw Hill
2. Generalized Theory of Electrical Machines, by P.S. Bimbhra, Khanna Publications, Delhi, 1992
3. Electrical Machinery, by P. S. Bimbhra, Khanna Publications, Delhi, 1996
4. Electrical Machine, by S. K. Bhattacharya, Tata McGraw Hill, New Delhi 1998

EE 4202   Signals and Systems : 4 Credits (3-1-0)

Unit-I	Introduction: Signals and Systems, Examples of signals and systems. Signal types: energy and power signals, continuous and discrete time signals, analog and digital signals, deterministic and random signals. Signal properties: symmetry, periodicity, and absolute integrability. Elementary signals: unit step, unit impulse, the sinusoid, the complex exponential; representation of signals as vectors.	5 lectures
Unit-II	Systems and system properties: linearity, shift-invariance, causality, stability, realizability; continuous time and discrete time linear shift-invariant (LSI) systems : the impulse response and step response; response to arbitrary inputs : convolution, interconnections; characterization of causality and stability of linear shift-invariant systems; system representation through differential equations and difference equations; eigen functions of LSI systems, frequency response and its relation to the impulse response.	7 lectures
Unit-III	Signal representation: signal space and orthogonal bases of signal, Fourier series representation; Fourier Transform and properties, Parseval's Theorem, time-bandwidth product; Phase and group delays; Hilbert transform, pre-envelope. Discrete-time Fourier Transform (DTFT): DTFT and properties, Parseval's Theorem; Discrete Fourier Transform (DFT) and properties.	12 lectures
Unit-IV	Laplace Transform for continuous time signals and systems:region of convergence, properties; s-domain analysis of LSI systems, poles and zeros of system functions and signals, stability, Minimum phase systems.	7 Lectures

Unit-V	Z-Transformation of discrete time signals and systems: region of convergence, properties, generalization of Parseval's theorem; Z-domain analysis of linear discrete-time systems, system functions, poles and zeros of systems and sequences, stability, minimum phase systems. Sampling theorem: spectra of sampled signals; reconstruction: Ideal interpolator, zero-order hold, first-order hold; aliasing and its effects.	11 lectures
	Total lectures 42	

Recommended Books:

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", PHI, 1983
2. R.F. Zeimer, W.H. Tranter and D. R. Fannin, "Signals and Systems-Continuous and Discrete", 4th edition, PHI, 1998
3. B. P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, 1998
4. Douglas K. Lindner, "Introduction to Signals and Systems", McGraw-Hill

EE 4203   Electrical Power Utilization : 4 Credits   (3-0-2)

Unit-I	Electric heating: advantages, classification, resistance heating, design of heating element, types of electrode, induction heating, dielectric heating, and dielectric loss calculation; electric welding: types of resistance welding, arc welding.	8 lectures
Unit-II	Electric traction: ac and dc systems, low frequency and high frequency systems, composite system and kando system	8 lectures
Unit-III	Illumination: nature of light, eye sensitivity, definition, laws of illumination, evaluation of different light sources, polar curve, Rousseau diagram, luminous efficacy, types of lamps, lighting schemes & its design. Life of the lamps and their mechanism of breakdown. Energy efficient illumination systems, case studies on efficient illumination systems; fundamentals of light efficient buildings.	9 lectures
Unit-IV	Electrochemical process: laws of electrolyte, electric deposition, application of electrolysis, factors affecting electro chemical process.	8 lectures
Unit-V	Refrigeration cycle, refrigeration systems, domestic Refrigerator, water cooler, desert cooler, air conditioning, industrial air conditioning, heating of buildings, calculation of rating of electrical equipments, related numerical problems.	9 lectures
	Total lectures 42	

Recommended Books:

1. Art and Science of Utilisation of Electrical Energy, by H. Pratap, Dhanpat Rai and Sons, Delhi, 1987.
2. Generation, Distribution and Utilisation of Electrical Energy, by C.L, Wadhwa, New Age Inter.
3. Electric Power Utilisation, by Taylor, Print Longman, Bombay, 1996

EE 4204   Power Electronics-I : 4 Credits (3-0-2)

Unit-I	Power Diodes: Basic structures and V-I characteristics, breakdown voltage, ON state losses, switching state characteristics, principle of operation, diode snubbers, Schottkey diodes.	6 lectures
Unit-II	Thyristor: thyristor family, operating principle of thyristor, dynamic characteristics, ratings and protection, temperature rise and cooling of thyristor; thyristor firing circuits: R and RC triggering circuit, UJT triggering; thyristor commutation-line, load and forced; series and parallel operation of thyristor.	9 lectures
Unit-III	Power MOSFETS: structure, V-I characteristics, switching characteristics, operating limitations and safe operating area, gate and snubber circuit, GTO: basic structures and characteristics; IGBT: structure and characteristics, drive and snubber circuit, FCT, MCT, RCT, Power BJT and its applications.	9 lectures

Unit-IV	Rectifiers: uncontrolled rectifiers: basic concepts, single phase bridge rectifier, three phase full bridge rectifiers, single phase controlled rectifiers: half-wave, full-wave and semi-converters.	9 lectures 9 lectures
Unit-V	Application of power electronics: ac voltage regulator, different types of choppers; speed control of dc motor; zero crossing detectors; timing circuits: monostable and astable type, 555 IC timer; introduction to PLCs.	
	Total lectures	**42**

RecommendedBooks:

1. Power Electronics, by P.S. Bimbhra, Khanna Publisher.
2. Power Electronics, by H.C. Rai, Galgotia Publications.
3. Power Electronics, by P.C. Sen, TMH.

EE 4001   Switched Mode Power Supply Systems : 4 Credits (3-0-2)

Unit-I	Introduction to power supply topologies: overview of switch mode power supply, basic operations of linear power supply regulators- basic operations, merits and demerits, fundamentals of switching regulators, applications.	8 lectures
Unit-II	Buck switching converters: basic operation, optimum switching frequency, design considerations for selection of output filter inductor and capacitors, switching losses and efficiency, applications; boost switching converters: basic operations-discontinuous and continuous modes, design considerations for discontinuous mode boost regulators, applications.	10 lectures
Unit-III	Push-Pull and Forward converters: basic operation-master/slave outputs, design considerations for power transformer, output filters, switching losses, limitations of output power and input voltage in push-pull topology; basic operation of forward converter topology, design considerations for input & output voltage, power transformer, filter circuit etc., applications.	8 lectures
Unit-IV	Half and Full bridge converters: basic operation, output filter design considerations, and limitations of output power in half bridge converter topology; basic operation of full bridge converter, design considerations for magnetic and filter circuit etc., applications.	8 lectures
Unit-V	Flyback converters: introduction, applications, basic operations in discontinuous and continuous mode, output filter design considerations for magnetic and filter circuit etc. under discontinuous and continuous modes, applications.	8 lectures
	Total lectures	**42**

Recommended Books:

1. Switching Power Supply Design, A. I Pressman, McGraw Hill Inc., New Delhi, 1991.
2. High Frequency Switching Power Supplies: Theory & Design, George Chryssis, McGraw Hill Book Company, New Delhi, 1995.
3. Power Switching Converters, Simon Ang, A. Oliva, Taylor& Francis, London, 2004.
4. Power Electronics: Converters, Applications & Design, Mohan, Undeland & Robbins, John Wiley & Sons, 2001
5. Power Electronics: Circuits, Devices & Applications, M. H. Rashid, Prentice Hall of India, New Delhi, 2001.

EE 4002   Instrumentation : 4 Credits   (3-0-2)

Unit-I	Accuracy, precision, types, classification and probability of errors, Gaussian errors; sensitivity, resolution and stability.	8 lectures
Unit-II	Mathematical model for instrumentation, calibration, transducers.	9 lectures
Unit-III	Measurement of temperature, flow pressure vibration and strain, nucleonic measurement.	9 lectures
Unit-IV	Fundamentals of RF telemetry, basic Telemetry system components, methods of coding	8 lectures
Unit-V	Bio Electronics: Equipment and principles.	8 lectures
	Total lectures	**42**

Recomended Books:

1. A course in Electrical and Electronics Meas. and Instr., by A.K. Sawhney, Dhanpat Rai and Sons.
2. Advanced Electrical Technology by H. Cotton, Wheeler Publication.
3. Electrical Measurement by E.W. Golding

EE 4003   Fundamentals of Microprocessors : 4 Credits   (3-0-2)

Unit-I	Evolution of Microprocessor, type pin out diagram and Architecture and Micro Computer Systems and their applications.	6 lectures
Unit-II	Instructions and Timing of Intel 8085 Microprocessor.	10 lectures
Unit-III	Assembly language programming of the Intel 8085.	10 lectures
Unit-IV	Interfacing the peripherals and applications.	10 lectures
Unit-V	Trends in Microprocessor Technology and Bus Standards, etc.	6 lectures
	Total lectures	**42**

Recomended Books:

1. Software Made Simple by R.K. Taxali, Tata Mc Graw Hill
2. Microprocessor Architecture Programming and Application, by R.S. Gaonkar, New Age International.
3. Digital Computer Electronics - An Introduction to Micro Computers by A.P. Malvino, TMH.

EE 4004   Illumination Engineering: 4 Credits   (3-1-0)

Unit-I	Visual system-structure, external factors of vision, continuous adjustment- photopic, scotopic and mesopic capabilities, perception, CIE standard observer, Glare- discomfort & disability glare. Chromaticity Coordinate and its application. CIE diagrams of different sources. spectral power distribution (SPD) of light sources.	6 lectures
Unit-II	Lighting design and calculation, relation between lumen and watt, photometric standards; Photometry measurement of luminous flux, illuminance, luminance, luminous intensity distribution.	9 lectures
Unit-III	Construction, characteristics and application of different types of lamps; luminaire: its function and classification, lamp and luminaire specifications.	9 lectures
Unit-IV	Life of lamps and their mechanism of breakdown; functions of ballast, starter/ ignitor; different lamp circuits and their operations, working principle of electronic ballast for FTL/CFL, polar diagram using DIALUX for various lamps.	9 lectures
Unit-V	Energy saving lighting schemes; basics of lighting control devices, their principles of operation; concept of energy efficient lighting system design, design approaches and options; lighting energy conservation measures; concepts of daylight integrated artificial lighting design; different design considerations: thermal, colour, visual comfort, assessment of energy saving with daylight.	9 lectures
	Total lectures 42	

Recomended Books:

1. IES Lighting Handbook - IES North America.
2. Applied Illumination Engineering - Jack L. Lindsey, The Fairmont Press, INC.
3. Lighting engineering: Applied Calculation- by R. H. Simons, A.R. Bean, Routledge, 2001

EE 4005   Rural Electrification and Utility of Solar PV : 4 Credits   (3-0-2)

Unit-I	Scenario of rural electrification in India, electrical load optimization, voltage regulation, load factor, diversity factor; importance of rural electrification for agriculture, type and management of agricultural loads; importance of renewable energy for augmentation of rural electrification; different flagship programs of Govt. of India for rural electrification.	6 lectures
Unit-II	Rural transmission and distribution systems: single phase, three phase systems and their applications in rural area; conventional energy metering, smart metering systems, electricity	5 lectures

	tariff; process of tariff collection, responsibility of end users for payment of tariff; electrical hazards and safety precautions in rural areas; responsibility of electrical engineers during natural calamities; energy saving schemes.	
Unit-III	Solar PV fundamentals and technologies: introduction to semiconductor physics, theory of p-n junction, operation of p-n junction as solar cells, parameters of solar cells, design of solar cells, solar cell materials & technologies, fabrication of crystalline Si solar cells, solar PV modules, PV module output as function of temperature and solar radiation.	9 lectures
Unit-IV	Applications of solar PV technologies: introduction to power electronics devices, off-grid and grid-connected PV systems, components of solar PV systems, charge controller, dc-dc converter, dc-ac converter, maximum power point tracking, energy storage options for solar PV systems, availability of solar radiation at a given location, design of off-grid PV systems, design of grid-connected PV systems, life cycle cost analysis.	10 lectures
Unit-V	Application of solar PV for rural electrification: standalone and grid connected operation, concept of micro-grid, distributed operation; cost estimation of solar PV power plants.	12 lectures
		Total lectures 42

Recomended Books:

1. Non-Conventional Sources of Energy, G. D. Rai, 4th Edition, Khanna Publishers, New Delhi, 1996.

2. Solar Energy, S. P. Sukhatme, 2nd Edition, TMH Publishing Co. Ltd, New Delhi, 1996.

3. Rural Electrification: Strategies for Distributed Generation, Hisham Zerriffi, Springer; 2011 edition (November 8, 2010).

Department of Electronics and Communication Engineering
Programme: Diploma in Electronics and Communication Engineering

Year ISemester I		L	T	P	C
PH-3101+	Physics-III A	4	0	2	5
CY-3101+	Chemistry -III	3	0	2	4
HS-3101+	Communication Skills	2	0	2	3
MA-3101	Engineering Mathematics-I	3	1	0	4
EC-3100	Networks, Filter and Transmission lines	3	0	2	4
ES-3100	Object Oriented Programming with C++	2	0	4	4
EC-3101*	Basics of Electronics Telecommunication and Workshop Practice	3	0	4	5
EC-3102*	Basic of Radio and TV Engineering	3	1	2	5
CE-3151*	Engineering Graphics	0	0	4	2
					24
Year ISemester II		L	T	P	C
ES 3200	Environment and Ecology	3	0	0	3
CY-3201	Engineering Chemistry I	3	0	2	4
MA-3202	Engineering Mathematics-II	3	1	0	4
EC-3200	Analog Circuits	3	1	2	5
EC-3201	Digital Electronics and Circuits	3	1	2	5
EC-3202	Electronic Engineering Materials	3	0	0	3
ME-3277*	Comprehensive Workshop –III (Audit)	0	0	6	0
EC-3221	Basic Electronic Circuit and Devices (for CS and EE Students)	3	0	2	4
(CS+EE)					
					24

* Bridge for 10+2 PCM / Bridge for 10+2 Vocational/NERIST certificate

Year II	Semester I	L	T	P	C
HS-4101	Principles of Economics	3	0	0	3
EE-4121	Electrical Engineering	3	0	2	4
EC-4100	Communication Engineering	3	0	2	4
EC-4101	Signal and Systems	3	1	2	5
EC-4102	Microprocessor and Computer Organisation	3	1	2	5
EC-4103	Electronic Instrumentation and Measurements	3	1	2	5
EC-4121	Electronic Circuit and Devices (for CS and EE Students)	3	0	2	4
(CS+EE)					
					26
Year II	Semester II	L	T	P	C
EC-4200	Linear Integrated Circuits	3	1	2	5
EC-4201	Industrial Electronics	3	0	2	4
EC-4202	Microcontroller and its applications	3	0	2	4
EC-4203	Network Analysis and Synthesis	3	1	0	4
EC-40**	Elective	3	1	0	4
EC-4251	Computer Hardware and Peripherals	1	0	4	3
EC-4299	Project (Diploma)	0	0	6	3
ED-4288	Extracurricular activities and descipline	0	0	0	2
					29
	List of Electives	L	T	P	C
EC 4001	Video and Advanced TV Engineering	3	1	0	4
EC-4005	Basic Satellite Communication	3	1	0	4
EC-4004	Medical Electronics	3	1	0	4
EC-4002	Instrumentation and Process Control	3	1	0	4
EC-4003	Transducers and Signal Conditioning	3	1	0	4

EC-3100 Networks, Filters and Transmission lines : 4 Credits (3 – 0 – 2)

Unit I	Network Theorems (DC and AC) - Mesh analysis, Thevenin, Norton, Superposition and Maximum power transfer theorems. Networks – One port, Two port, Balanced, unbalanced, Active , Passive, T, PI, Lattice, Ladder networks, Concepts and significance of Characteristic impedance, propagation constant, attenuation constant, phase shift constant of T and PI network, Star-Delta transformation.	10 lectures
Unit II	Series Resonance: properties of series RLC resonance circuit, bandwidth, selectivity, frequency response, Parallel Resonance : properties of parallel RLC resonance circuit, bandwidth, selectivity, frequency response.	7 lectures
Unit III	Study of various types of Attenuators and Equalizers (Qualitative treatment only)and their applications	8 lectures
Unit IV	Various types of Passive Filters, LPF, HPF, BPF, BSF, m-Derived and their applications, basic concept of active filters and their comparison with passive filters.	8 lectures
Unit V	Transmission-line Equation and solutions, Reflection and Transmission coefficients, Standing wave and Standing wave ratio. Line Impedance and Admittance. Smith chart and Single stub matching	9 lectures

Recommended books :
1. Networks, Lines and Fields, John D.Ryder. (PHI) 1st Ed.1978
2. Circuit Theory (Analysis and Synthesis), A. Chakraborty (Dhanpat Rai & Co.)3rd Ed.2010
3. Network Analysis, M.E.VanValkenburg (PHI) 2nd Ed. 2006
4. Network and Systems, D.Roy Choudhury (New Age International).1st Ed. 1998
5. Networks, Filters and Transmission lines, P.K.Jain, Gurbir Kaur.(TMH).1st Ed. 1994

ES 3100   Object Oriented Programming with C++ : 4 Credits (2-0-4)

Unit I	Overviews of C, Procedural Vs Object Oriented Programming (OOP), characteristics of OOP, Variables, constants, operators in C++, Functions: Function Prototyping, Call by reference, Call by Value, Return by Reference, Inline Function, Constant Arguments, Function.	3 lectures
Unit II	Classes & Objects, Arrays within a Class, Memory Allocation for Objects, Static Data Members, Static Member Functions, Arrays of Objects, Object as Function Arguments, Friend Functions, friend classes, Returning Objects, Constant member functions, Pointer to members, Constructor : Parameterized Constructor, Multiple Constructor in a Class, Constructors with Default Arguments, Dynamic Initialization of Objects, Copy Constructor, Dynamic constructor, Destructor and its uses	7 lectures
Unit III	Operator Overloading: Defining operator Overloading Overloading Unary, binary Operators, Overloading Binary Operator Using Friends, Manipulating of String Using Operators; Type Conversion details	7 lectures
Unit IV	Inheritance: Single, Multilevel, Hierarchical, Multiple, Hybrid Inheritance, Virtual Base Classes, Abstract Classes, Constructor in Derived Classes, Nesting of Classes.	4 lectures
Unit V	Pointers, Pointer to Object, This pointer, Pointer to Derived Class, Virtual Function, Pure Virtual Function, Polymorphism implementations. Working with files, Command Line Arguments.	7 lectures

Recommended books :
1. E. Balaguruswamy, "Objected Oriented Programming with C++", TMH.
2. R. Venugopal , Rajkumar, T. Ravishankar, "Mastering C++",TMH

EC-3101 Principles of Electronic Telecommunication and Workshop Practice : 5 Credits (3 – 0 – 4)

Unit I	PN Junction electronics, Intrinsic and extrinsic semiconductors, charge densities, diffusion and drift current, Depletion/Diffusion capacitance , Break down, PN junction under forward and reverse bias, V-I characteristics, current equation, Zener and its characteristics	10 lectures
Unit II	Transistors: Basic principles of operation, I/V characteristics, Modes of operation., α, β calculations. Amplifier configuration: CE, CB, CC, Biasing of Transistors, Load line and Q point. Introduction to Class A, B and C amplifier circuits. Simple calculation of Voltage/ current gain (using simplified pi model), introduction to power amplifiers, multistage amplifiers and audio amplifiers.	10 lectures
Unit III	Fundamentals of communication Engineering: Introduction to electromagnetic wave spectra, types of propagation, ground wave, space wave, sky wave, ionosphere, skip distance, radio horizons, skip zones. Introduction to communication system: telephony, telegraphy, radio and TV.	10 lectures
Unit IV	Systems of units and standards of measurement. Working principles of various electronic meters (ammeter, voltmeter, multi-meter and watt meter) and CRO.	8 lectures
Unit V	Introduction to IC: Familiarization with popular ICs. Workshop: Soldering practice, PCB making, transformer winding, Anodized plate making.	4 lectures

Recommended books :
1. Electronic Devices and Circuit theory, by Robert L boylestad and Louis Nashelshky.Prentice Hall 1996
2. Electronics Principles by A.P. Malvino (TMH) 2008
3. Microelectronics by J. Millman and Arvin Grabel.(TMH), 1999
4. Integrated Electronics by   J. Millman and C.C Halkias.(TMH), 2001

EC-3102   Basic of radio and television engineering : 4 Credits(3 – 1 – 2)

Unit I	Introduction to communication systems-Telephone, Radio and TV, RADAR, Satellite and Optical communication systems.	6 lectures
Unit II	AM Transmitter: Classifications. Constituent stages of AM Radio transmitter. Different types of Modulators and AM power amplifiers. Antennas and matching circuits for an AM transmitter. Privacy device in Radio Telephony, SSB transmission. Radio telegraph transmitters. Reactance tube modulators. AM Receiver:Role of a receiver, receiver requirements, TRF receiver, super heterodyne receiver, double-conversion receiver, direct conversion (homodyne) receiver. Receiver specifications, receiver sensitivity, minimum detectable signal, noise figure, selectivity, dynamic range, automatic gain control (AGC), image rejection, compression, third-order intermodulation. Selection of IF frequency, local oscillator tracking, role of filtering in RF and IF stages in super heterodyne receiver. Block diagram of commercial AM	11 lectures
Unit III	FM Transmitter: FM transmitter using reactance tube modulators, stabilization of frequency drift, Armstrong FM transmitter, Antennas and matching circuits for an FM transmitter. Transmitter power supply system. FM Receiver: Limiter, detectors, slop detector, balance slop detector, Foster-sheely discriminator, ratio detector, stereo FM multiplexing reception.	11 lectures
Unit IV	TV Transmitter: Television signal propagation and antennas. Modulation system, Duplexer, TV antennas, Signal reception, Ghost Image. Types of telecasting, Production standards NTSC, PAL, SECAM. TV Receiver: Types, Basic principle, Picture tubes, Video circuits, AGC circuits, Sync circuits, Color circuits, Automatic color circuits, Deflection oscillators, Vertical deflection circuits, Horizontal deflection circuits, The picture IF section, Cable distribution system.Colour TV receiver: Essentials of Colour television, Principle of colour TV, Colour picture tubes, Colour signal transmission and reception.Different TV types Plasma, LCD,LED, OLED.	14 lectures

Recommended books :
1. Monochrome and Colour Television. R.R.Gulati. (Wiley Eastern)
2. Monochrome and Colour Television. Practice by R.R.Gulati. (Wiley Eastern)
3. Basic Radio and Television . S.P.Sharma
4. Radio and TV Engineering by G. K. Mithal
5. Electronic Communication Systems. George Kennedy. (TMH).

CE 3151   Engineering Graphics : 2 Credits (0 – 0 – 4)

Unit I	Lines lettering & dimensioning; Engineering curves: Conic sections, Cycloid, Involute, Spiral, Helix etc.	6 lectures
Unit II	Projection of points straight lines & planes.	10 lectures
Unit III	Projection of solids, auxiliary views, and sectional views.	10 lectures
Unit IV	Development of surfaces, and Isometric drawings/views.	16 lectures

Recommended books :

1. Elementary Engineering Drawing, N.D. Bhatt and M. Panchal, Charotar Publishing House, Anand, 2000.
2. Engineering Drawing, Venugopal, Wiley Eastern Ltd, New Delhi, 1992.
3. Engineering Drawing & Graphic Technology, FrenchT.E., Vierck C.J. & Forester R.J., McGraw Hill International, Singapore, 1993.

ES-3200 Environment and Ecology : 3 Credits (3 – 0 – 0)

Unit I	Basic Concept of Environment and Ecology: Introduction, types of environment, components of environment, environmental studies, need for public awareness, Introduction to ecosystem, classification of ecosystem, structure of ecosystems, functioning of ecosystems, balance of ecosystems	6 lectures
Unit II	Environmental Impact of Human Activities: Impact of industrialization, modern agriculture, housing, mining, and transportation on environment.	10 lectures
Unit III	Natural Resources: Classification of natural resources, water resources, mineral resources, forest resources, material cycles, energy resources, electromagnetic radiation.	10 lectures
Unit IV	Environmental Pollution: Types of environmental pollution, water pollution, waterborne diseases, land pollution, noise pollution, air pollution, automobile pollution, effects of environmental pollution, public health aspects, solid waste management	4 lectures
Unit V	Current Environmental Issues: Population growth, global warming, climate change, urbanization, acid rain, ozone layer depletion, animal husbandry.	6 lectures
Unit VI	Environmental Protection: Role of Government, Legal aspects, initiatives by NGOs, environmental education, women's education	6 lectures

Recommended books :

1. Concepts of Physics, vol. I and II, H. C. Verma, Bharti Bhawan
2. Physics, R. Resnick, D. Halliday & K. S. Krane,
3. University Physics, F. M. Sears, M. W. Zemansky & H. D. Young, Norosa Publishing House
4. Material Science and Engineering, V. Raghavan, Prentice Hall of India

ES-3200 (3 – 0 – 0)   Environment and Ecology

Unit I	Linear ordinary differential equation of order two with constant coefficients and variable coefficients, Complementary function and particular integrals, Variation of parameter method, Method of undetermined coefficients, Differential Equation of first order but not of first degree.	6 lectures
Unit II	Partial differential equation, Linear partial differential equation, Lagrange's Method.	10 lectures
Unit III	Fourier series, Even and odd functions, halfrange Fourier series, Fourier series for functions having arbitrary period, Fourier integral, Fourier Transform	10 lectures
Unit IV	Measure of central tendency and dispersion: Mean, median, mode, fractiles, Range, Quartile deviation, Mean deviation, Standard Deviation, Coefficient of variation; Moments, Skewness and Kurtosis. r Probability: Various approaches of probability, Classical frequency, Statistical, Subjective, and axiomatic theorems on probability, conditional probability, Multiplication theorem, Independent events, Baye's theorem. Random Variables: Discrete and Continuous, Probability mass function and probability density function, Probability distribution, Repeated Poisson and Normal distributions.	16 lectures

Recommended books :

1. Engineering Mathematics Vol-I, S.S. Sastry, Prentice Hall ofIndia, New Delhi, 1999.
2. Calculus and Analytic Geometry, Thomas & Finny, Narosa Publishing House, New Delhi, 1998.
3. Advanced Engineering Mathematics, E. Kreyszig, John Wiley& sons, NY, 1999.
4. Higher Engineering Mathematics, H.K. Dass, S Chand & Co., New Delhi, 2001: Fundamental of Statistics Vol I by Goon, Gupta and Das Gupta.

EC-3200 Analog circuits :4 Credits (3 – 1 – 2)

Unit I	BJT: Operation and Structure, Transistor Models and Characteristics, Operation in Saturation. BJT Configurations, biasing techniques. Low frequencies, High frequency models for BJT, BJT Amplifiers, h- parameters. Hybrid model for transistor amplifiers. Amplifier performance parameters in terms of h-parameters; r-parameters.	12 lectures
Unit II	FET and MOSFET: Operation and Structure, Device Models. Junction field effect transistor (JFET), MOSFET types, biasing, Small signal parameters. Common Drain, Common source and common gate amplifiers. Small signal analysis. FET as constant current source. MOS Capacitor, CMOS Circuits.	10 lectures
Unit III	Power Amplifiers: Analysis and design of class A, B, AB, C amplifiers and distortion and efficiency calculations. Push pull amplifiers.	10 lectures
Unit IV	Multistage amplifier: Need, Gain expression, types - RC coupled, transformer coupled, direct coupled, and their frequency response and bandwidth.Tuned Amplifiers: Need for tuned circuits, Single Tuned Amplifiers, Double tuned, Synchronously tuned amplifiers.	10 lectures

Recommended books :

1. Fundamentals of Microelectronics, Behzad Razavi, John Wiley & Sons, 1st Ed. 2009
2. Electronic Devices and Circuits, Fourth Edition by David A. Bell. (PHI).1st Ed. 1999
3. Electronics Principles By: A. P. Malvino, TMH. 2nd Ed. 2008
4. Microelectronic by Adel S. Sedra and C Smith, Oxford university press.4th Ed. 1998
5. Integrated Electronic circuits By: J. Millman and C.C. Halkias, 4th Ed. TMH.2001
6. Pulse Digital and Switching Waveforms by Taub and Shilling, 5th Ed. TMH.2011
7. Electronics Circuits By: D. Shilling, 3rd Ed. Tata McGraw 2002

EC-3201 Digital Electronics and Circuit : 4 Credits (3 – 1 – 2)

Unit I	Number System and Boolean Algebra: Binary Numbers. Hexadecimal number, binary addition, substraction, r's complement & (r-1)'s complement, binary multiplication and Division. Codes and their conversions: BCD, Octal, Hexadecimal, ASCII, Gray, Signed binary number representation with 1's and 2's complement method. Boolean Algebra: Boolean identities, De Morgan's theorems. SOP, POS. Concepts of min term and max terms. AND-OR networks. Algebraic Simplification. Karnaugh Map , MEV technique and Quine-McClusky method	10 lectures
Unit II	Combinational Circuit: Basic logic gates and universal Gate. Design of Combinational logic circuit. Half Adder, Full adder, Ripple Carry adder, the carry look-ahead adders. Half- Subtractor, Full Subtractor, code converter, decoder, multiplexer, de-multiplexer parity generator and checker.	10 lectures
Unit III	Logic Families: Different Logic families- TTL, ECL, MOS and CMOS, their operation Circuits for INVERTER,NAND, NOR.Transfer Characteristics, noise margin, propagation delay, fan in fan out, power dissipation consideration.	6 lectures
Unit IV	Data Processing Circuits MSI CHIPS: Multiplexer, Decoder, Decoder driver, 7 segment display decoder driver, Encoders Octal to Binary, Decimal to BCD encoders, Priority encoders. Implementation of combinational circuit by MSI chip.	6 lectures
Unit V	Sequential Circuits: The RS flip-flop, D, T, JK Flip flop. Edge triggered Flip Flops, master Slave FF. Counter. Asynchronous and Synchronous counter, higher Modulus counters. Multimode counter. Registers Serial and Parallel Shift registers, Universal Shift Registers. Shift register Counter.	10 lectures

Recommended books :

1. Digital Systems: Principles and Applications, Ronald J .Tocci, 6th Ed, Prentice Hall of India,New Delhi.2001
2. Digital Principles and Applications, A.P.Malvino, D.P.Leach, 4th Ed ,Tata McGraw Hill, New Delhi.1993
3. Fundamentals of Logic Design, C.A.Roth, Jr., Jaico, 4th Ed, Publishing House,Bombay,2013
4. Digital Design. Morris Mano. 4th Ed. PHI, 2008
5. Fundamentals of Digital Circuits, A. Anand Kumar, 4th Ed. PHI, 2016
6. Digital Integrated Electronics- H.Taub & D.Shilling, 1st Ed. Mc Graw Hill.1977
7. Modern Digital Electronics R.P Jain, 4th Ed. TMH, 2010

EC 3202 Electronic Engineering Materials : 3 Cedits (3 – 0 – 0)

Unit I	Conducting materials - Effect of temperature on resistivity of different conducting materials, Metal and alloys for fuses, Properties and specifications of wire, cable and antenna material. Semiconducting materials - Element and compound semiconductors and their properties, Carrier concentration in semiconductors, Variation of fermi level and carrier concentration with temperature, Hall effect.	12 lectures
Unit II	Magnetic materials – Different types of magnetic materials and their properties, Diamagnetism, Paramagnetism, ferromagnetism, anti-ferromagnetism and ferrimagnetism. Hard and Soft magnetic materials, Magnetic materials used at high frequencies. Frequency dependence of dielectric constant; Ferroelectricity and Piezoelectricity in materials.	10 lectures
Unit III	Optical properties of materials: metals, insulators and semiconductors, Phosphorescence and fluorescence, Different phosphors used in CRO screens, Liquid crystal as display, materials for LEDs, Photoconductivity and photo conducting materials. Light interaction with solids; Absorption, Transmission and Reflection; Luminescence; Photoconductivity; Lasers.	10 lectures
Unit IV	Insulating materials- Atomic interpretation of dielectric material of mono atomic gases and poly atomic molecules, general feature of static dielectric constant of solids, piezo electricity and piezoelectric materials, Dielectric properties in alternating fields: Frequency dependence of electronic and ionic polarizability, complex dielectric constant, dielectric relaxation and losses, temperature dependence, superconductors.	10 lectures

Recommended books :

1. Electronics Engineering Materials and Devices, John Allyson, 1st Ed. ,Tata McGraw Hills 1973
2. Introduction to Materials Science for Engineers, James Shakelfolk, 6th Ed. Macmillan Publishing Co. 2007
3. Materials Science and Engineering, V. Raghavan, 2nd Ed. Prentice Hall of India. 2015
4. Electrical Engineering Materials, A.J.Dekker, 3rd Ed. Prentice Hall of India, New Delhi 2007

ME-3277   Comprehensive Workshop –III (Audit) : 3 Credits (0 – 0 – 6)

Unit I	Introduction to safety aspects in workshop and different tools (functions, types and specifications) used in different shops.	6 lectures
Unit II	Carpentry Shop: Introduction to woodworking, kinds of woods, hand tools and wood working machines etc.; Simple joints.	10 lectures
Unit III	Fitting Shop: Introduction to fitting shop tools (functions, types and specifications) equipment and operations. Fitting jobs.	10 lectures
Unit IV	Welding & Forging Shop: Introduction to gas and arc welding, Soldering& brazing Practice. Simple forging job.	4 lectures

Recommended books :

1. Workshop Technology (Vol I & II) – Hazra & Chowdhury , MPP Ltd.

EC-3221   Basic electronics circuits and devices (CS and EE) : 5 Credits (3 – 0 – 4)

Unit I	PN Junction: PN Junction: Junction formation, step PN junction atequilibrium, PN junction capacitance, breakdown of junctions, PNjunction forward bias, IV characteristics. Diode Characteristics: Diode as acircuit element, Load line concept; Large signal diode model, small signaldiode model, Theory of Zener diode and regulator circuit. DisplayDevices: LED, LCD and seven segment display (Commonanode/cathode).Regulated Power Supply: Working principles of regulatedpower supply, Regulator ICs	12 lectures
Unit II	Transistors: Basic principles of operation, I/V Characteristics, Modes ofoperation: Active, saturation and Cut off alpha, beta. Amplifierconfiguration: CE,CB,CC, Biasing of Transistors, Load line and Q point.	5 lectures
Unit III	Power Amplifiers: Introduction to class A,B and amplifier Circuits.Simple calculation of Voltage/ Current gain (Using simplified pi model). Input/Output impedance. Power amplifier. Elementary ideas on feedbackamplifier with example circuits and properties.	7 lectures
Unit IV	Oscillators: Operation of Colpitts and Hartley Oscillator, other oscillators,configurations and their specific applications. Introductory idea and usesof multivibrators : Astable, Monostable and Bistable.	6 lectures
Unit V	Operational Amplifier: Introduction to op-amp, uses of opamp asinverting, non inverting amplifiers, adder, subtractor, integrator anddifferentiator. JFETs & MOSFETs: JFET introductory ideas, MOSFET MOSFET :Structure, physical behaviour, I/V characteristics, NMOS, PMOS, CMOS,MOS amplifiers and logic gates.	12 lectures

Recommended books :

1. Electronic Devices and Circuit theory, 8th ed. by Robert L boylestad and Louis Nashelshky.
2. Electronics Principles by A.P. Malvino (TMH)
3. Microelectronics by J. Millman and Arvin Grabel.(TMH)
4. Integrated Electronics by J. Millman and C.C Halkias.(TMH)

EE 4121   Electrical Engineering : 4 Credits (3 – 0 – 2)

Unit I	Introduction to Circuit Elements: Resistance, Capacitance and Inductance and their behavior with ac and dc. Different types of sources and equivalent conversions. Test signals, assumptions for circuit analysis, classification of elements	6 lectures
Unit II	Transformer: principle of operation, construction of single phase transformer, types, EMF equation, equivalent circuit, phasor diagram of transformer on load and no load condition, transformer losses, efficiency and voltage regulation, autotransformer: construction, working and applications.	10 lectures
Unit III	Electro-mechanical energy conversion, torque, rotating magnetic fields, d.c machines: types, construction, motor and generator action, performance characteristics of motor and generator, voltage and speed regulation, speed control, losses in dc machine and applications	10 lectures
Unit IV	A.C machines: alternators, three-phase induction motor, their construction, working principle, performance characteristics, starting, single phase induction motors, causes and effect of low power factor, power factor improvements,	7 lectures
Unit V	Measuring instruments: moving iron and moving coil type voltmeter, ammeter, principle of operation, construction, extension of range, wattmeter and energy meters, methods of single and three phase power measurements.	9 lectures

Recommended books :

1. A Course in Electrical Circuit Analysis, Soni and Gupta, Dhanpat Rai and Sons, Delhi, latest edition
2. Networks and Systems, D. Roy Chaudhury, New Age International, New Delhi, 1996
3. Electrical Machines, by S.K Bhattacharya, TMH, 2/e, 1998 (Re-print 2005).
4. Problems in Electrical Engineering, Parker Smith, CBS Publication, New Delhi, latest edition.
5. Fundamentals of Electrical Engineering and Electronics by B.L. Theraja, S.Chand Publication, 2003
6. Electrical Machines by B Gupta, SK Kataria and Sons, New Delhi.
7. A Course in Electrical Measurement and Measuring Instruments by AK Sawhney and PL Bhatia; Dhanpat Rai and Sons, New Delhi,1999
8. Basic Electrical Engineering by Fitzgerald, Mc-Graw Hill, 1981

EC 4100   Communication Engineering : 4 Credits (3 – 0 – 2)

Unit I	Introduction to various types of signals used in communication engineering and their Mathematical representations. Brief study of mathematical tools: Fourier series, Fourier Transform.	8 lectures
Unit II	Detailed study and analysis of AM, FM and PM and their respective Demodulation Techniques, Advantages of FM over AM. AM Limiters. Pre-emphasis and De-emphasis. Block schematics of different Broadcasting Transmitters for AM, FM, SSB, ISB systems. Block schematics of different Communication Receivers covering Super heterodyne technique.	10 lectures
Unit III	Introduction to Pulse Modulation techniques- PAM, PPM, PDM and PCM systems. TDM and FDM systems and their comparison.	8 lectures
Unit IV	Propagation of EM waves- Propagation characteristics of surface, sky and space waves. Propagation characteristics at different frequencies. Classification of EM Spectra. Fundamentals of Electromagnetic Radiation.	9 lectures
Unit V	Antennas- (Qualitative treatment only) Various parameters: Gain, Directivity, Power gain, Aperture, Radiation pattern, Beam angle etc. Point source. Propagation of Radio waves.	7 lectures

Recommended books :
1. Introduction to Analog and Digital Communication, Simon Haykin John Wiley & Sons 2009
2. Electronic Communication Systems, G. Kenedy&Bermard, 4th Ed. Tata McGraw Hill 1999
3. Electronics Communication, Roody&J.Coolen, 4th Ed. Prentice Hall 1977
   Modern Digital and Analog Communication System, B.P.Lathi, 4th Ed. Oxford University Press, 2010

EC 4101   Signal and Systems : 5 Credits (3 – 1 – 2)

Unit I	Continuous and discrete time signals: Classification of Signals, Transformation of independent variable of signals, Basic continuous-time and discrete-time signals.	4 lectures
Unit II	Basic system properties. Analysis of Continuous-time and Discrete-time LTI Systems and their properties. Linear constant co-efficient differential and difference equations.	8 lectures
Unit III	Fourier-series and Fourier Transform representation of Continuous-time Signals and their properties. Discrete-Time Fourier-series and Discrete-Time Fourier Transform representation of discrete-time Signals and their properties.	11 lectures
Unit IV	Laplace Transform and its properties. Unilateral Laplace Transform. Analysis of LTI systems using Laplace-transform. Z-transform and its properties. Unilateral Z-Transform. Analysis of LTI systems using Z - transform.	11 lectures
Unit V	Sampling and reconstruction of band limited signals. Low pass and band pass sampling theorems. Aliasing. Anti-aliasing filter. Practical Sampling-aperture effect.	8 lectures

Recommended books :
1. Signals & Systems, Alan V. Oppenheim, Alan S. Willsky , S. Hamid Nawab, 2nd Ed., Pearson Education. 2013
2. Signals and Systems, S.Haykin and B. VanVeen , 2nd Ed. Wiley.2007
3. Signal Processing and Linear Systems, B.P.Lathi, PHI 2009
4. Principles of Linear Systems and Signals, B.P. Lathi, 2nd Ed. Oxford.2009

EC-4102   Microprocessor and Computer Organization : 5 Credits (3 – 1 – 2)

Unit I	Concepts and Terminology: Digital computer concepts; Von-Neumann and Harvard architectures concept,Hardware and Software and their nature, role of operating system Evolution of computer architectures, different generations RISC and SISC architecture.	6 lectures
Unit II	Memory Unit : Memory classification, characteristics, static memories, dynamic memories, Organization of RAM, address decoding, ROM/PROM/EEPROM, Concept of memory map, memory hierarchy, Associative memory organization, Cache introduction, Replacement algorithms, Hit rate, miss penalty. Concept of virtual memory and paging.	8 lectures
Unit III	Microprocessors: Architecture of Intel 8085A microprocessor. Register organization, pin description. Instruction sets, operand addressing modes, instruction cycle, machine cycle, Timing diagram.Introduction to 8066/8088/X86.	8 lectures

Unit IV	Programming: Concept of Micro and Macro programming, arithmetic and logical computations, block of data moving looping, counting, time delaying operations. Stack and subroutines, Concept of stack memory.	10 lectures
Unit V	Interrupts and Peripherals: Vectored interrupts, maskable and unmaskable interrupts. Intel 8085 software and hardware interrupts and their working mechanism. Usage of RIM, and SIM instructions. Peripherals: Introduction to I/O addressing. Study of peripherals like Intel 8255, 8257, 8254 and 8251.	10 lectures

Recommended books :

1. Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 5th Ed. McGraw Hill International, 2001
2. Computer Architecture and Organization, J.P.Hayes, 3rd Ed. Mc Graw Hill International, 1998
3. Microprocessor Architecture Programming Application with the 8085/8080A, R.S. Gaonkar, 6th Ed.Prentice Hall of India, 2013
4. Introduction to Microprocessors, A.P.Mathur, 3rd Ed. Tata McGraw Hill,2001
5. Fundamental of Microprocessor and Microcomputers, B. Ram, 1st Ed. Dhanpat Rai & Sons.2005

EC4103   Electronic Instrumentation and Measurements : 5 Credits (3 – 1 – 2)

Unit I	Generalized Measurement system: Accuracy, Precision, Fidelity, speed of response, static & dynamic performance characteristics, dynamic- step response, ramp response of first order instrument. Classifications of errors, error analysis of measurement.	6 lectures
Unit II	Introduction to DC and AC bridges for measurement of voltage / current / resistance / capacitance and inductance.	10 lectures
Unit III	Digital multimeter, Signal generator and Function generator using multi op-amp and crystal.	10 lectures
Unit IV	Frequency synthesizers (digital and analog). Principle and Working of voltmeter, ammeter and ohmmeter, Introduction to DVM, Electronic multimeter. Cathode Ray Oscilloscope- Introduction, cathode ray tube, electron gun, deflection plates, basic CRO circuit, Lissajous pattern.	7 lectures
Unit V	Definition of transducer, classification, resistive, capacitive, inductive, magnetic, optical, piezoelectric, pneumatic.	9 lectures

Recommended books :

1. Principles of Electronics instrumentation and measurements. Berlyn and Getz(McMillan Pub.Co.)
2. A Course in Electrical Electronics Measurements and instrumentation. A.K. Sawhney (Dhanpat Roy & Co.).
3. Modern Electronics Instrumentation and Measurement Techniques Albert D.Heltrick, W. D. Cooper. (PHI).
4. Murthy DVS – Transducers & Instrumentation, PHI, ND, 1995.
5. Elements of Electronic Instrumentation and Measurement. Joseph J. Carr. Pearson Education
6. PC-Based Instrumentation Concept and Practice N. Mathivanan PHI

EC 4121   Electronics circuits and devices (CS and EE) : 4 Credits (3 – 0 – 2)

Unit I	BJT Amplifier: Analysis of BJT amplifier, analysis of differentialamplifiers. OP-AMPs: Introduction to op-amp, offset voltage/currents, CMRR, opampbuffer, half wave & full wave rectifier, active filters (first and secondorder LP,HP and BP), performance comparison of typical op-amp (741C,LM411, LM118, LM108, QD611.)	10 lectures
Unit II	Regulated Power Supply: Regulated power supply design, capacitive(CRC) filter based power supply, Linear series regulators, single op-ampregulator, three terminal regulators, adjustable power supply, Linear ICssuch as LM78XX, LM79XX, LM317, LM 337, Switched capacitorconversion (LM-7660). Switching power supply, Basic principles, Buckregulator, Boost regulator.	7 lectures
Unit III	Tuned Amplifiers: Single tuned circuit, FET & BJT amplifier, FET tunedamplifier, tuned transistor amplifier with tuned load, narrow bandapproximation and tuning (Synchronous & Stagger), cascade tuned IFamplifier, Design of tuned amplifier, oscillator possibility and sensitivity.Oscillators: Wein bridge, phase shift, twin T and crystal oscillators.	10 lectures
Unit IV	Feedback Amplifier: Classification of feedback amplifier, feedbackconcept, principles of operation of four types of feedback amplifiers,(Voltage series/shunt, current series/shunt), input impedance, outputimpedance, band width, gain desensitivity, merits and demerits.	7 lectures
Unit V	Power Switches and ICs: Introductory idea and use of SCR, Diac, Triacand UJT circuits. Integrated Circuits: Introduction to IC, familiarizationwith popular IC NE/SE-555, 7400 7402, 7406, Audio and Videoamplifiers.	8 lectures

Recommended books :
1. Basic Electronics and Linear Circuits, 6th Ed., N.N. Bhargav, D.C. Kulshreshta, S.C.
2. Gupta,Tata McGraw Hill, New Delhi, 2001
3. Electronics Principles, 6th Ed., A.P. Malvino, Tata McGraw Hill, New Delhi, 1999.
4. Micro Electronics, 2nd Ed., J. Millman, Arvin Grabel, Tata McGraw Hill, New Delhi,1999.
5. Integrated Electronics, J. Millman, & C.C. Halkias, Tata McGraw Hill, New Delhi, 1999

EC-4200   LINEAR INTEGRATED CIRCUITS : 4 Credits (3 – 0 – 2)

Unit I	Feedback amplifier: Feedback concept, characteristics of negative and positive feedback. Four feedback topologies, effect of negative and positive feedback on input impedance, output impedance, voltage gain, band width, noise and frequency response.	10 lectures
Unit II	OPAMP: characteristics, open loop gain, negative feedback configurations, amplifier, differential amplifiers, linear and non-linear applications.	10 lectures
Unit III	OSCILLATORS: Classification, Barkhausen Criterion, frequency stability, Tuned based Oscillators, Hartley Oscillator, Colpitts Oscillators, Clapp Oscillator, Crystal Oscillator, Phase Shift Oscillator, Wein Bridge Oscillator, voltage controlled oscillator Oscillator circuit design using BJT, FET and OP-AMP	10 lectures
Unit IV	ACTIVE FILTERS, COMPARATORS and CONVERTERS: classification and characterization of filters, types of active filters-first order and second order. Comparator and its characteristics, zero crossing detector, voltage limiters, absolute value detectors, analog multipliers and types of signal generators. Converters : types of ADC and DAC, working principle, characteristics. PLL and its applications.	12 lectures

Recommended books :
1. Operational Amplifiers with Linear Integrated Circuits 4th Edition,Author(s): William D. Stanley, Publisher: Pearson (2004)
2. Op-Amps and Linear Integrated Circuits 4 Edition Author(s): Ramakant A. Gayakwad Publisher: PHI Learning (2009)
3. Electronics Principles By: A. P. Malvino,Tata McGraw Hill
4. Microelectronic By: adel S. Sedra and C Smith,Oxford university press.
5. Integrated Electronic circuits By: J. Millman and C.C.Halkias, TMH.
6. Pulse Digital and Switching Waveforms By: Taub and Shilling, TMH.
7. Electronic Devices and Circuits, Fourth Edition by David A. Bell. (PHI). Electronics Circuits By: D. Shilling, Tata McGraw

EC-4201   Industrial Electronics : 4 Credits (3 – 0 – 2)

Unit I	Power diodes - basic structure and V-I characteristics - various types - power transistors - BJT, MOSFET and IGBT - basic structure and V-I characteristics - thyristors - basic structure - static and dynamic characteristics - device specifications and ratings - methods of turning on - gate triggering circuit using UJT - methods of turning off - commutation circuits - TRIAC	10 lectures
Unit II	Line frequency phase controlled rectifiers using SCR - single phase rectifier with R and RL loads - half controlled and fully controlled converters with continuous and constant currents - SCR inverters - circuits for single phase inverters - series, parallel and bridge inverters - pulse width modulated inverters - basic circuit operation.	10 lectures
Unit III	AC regulators - single phase ac regulator with R and RL loads- sequence control of ac regulators - cycloconverter - basic principle of operation - single phase to single phase cycloconverter - choppers - principle of operation - step-up and step-down choppers - speed control of DC motors and induction motors.	11 lectures
Unit IV	Switching regulators - buck regulators - boost regulators - buck-boost regulators - cuk regulators - switched mode power supply - principle of operation and analysis - comparison with linear power supply - uninterruptible power supply - basic circuit operation - different configurations - characteristics and applications	11 lectures

Recommended books :
1. Ned Mohan et.al, Power Electronics, John Wiley and Sons, 1989
2. Sen P.C., Power Electronics, Tata Mc Graw Hill,2003
3. Rashid, Power Electronics. Prentice Hall India,1993
4. G.K. Dubey et.al, Thyristorised Power Controllers, Wiley & Sons, 2001
5. Dewan & Straughen, Power Semiconductor Circuits, Wiley & Sons, 1984
6. Singh M.D & Khanchandani K.B., Power Electronics, Tata Mc Graw Hill, 1998

EC 4202 Microcontrollers and Applications : 4 Credits (3 – 0 – 2)

Unit I	The 8051 microcontroller: Evolution of microcontrollers, overview of the 8051 family.	7 lectures
Unit II	Assembly language programming: Arithmetic, logical, jump, loop, call instructions. Input/ Output port programming: pin descriptions of the 8051, I/O programming; bit manipulation	9 lectures
Unit III	Addressing modes: Immediate and register addressing modes; memory accessing. Timer/Counter programming.	9 lectures
Unit IV	Serial communication: basics, connection to RS232 and programming. Interrupts: different types and their programming	8 lectures
Unit V	Real world interfacing: LCD, ADC, Sensors, stepper motors, keyboards Introduction to advance microcontrollers, architecture of PIC/ARM/ AVR.	9 lectures

Recommended books :
1. The 8051 Microcontroller and Embedded Systems, M. A. Mazidi, and J.G. Mazidi, Pearson Education
2. Microcontroller Projects in C for 8051, D. Ibrahim, Newnes
3. D.V. Gadre, Programming and customizing the AVR Microcontroller, TMH, 2nd Ed.
4. John B. Peatman, Design with PIC Microcontroller, Pearson.

EC-4203 Network Analysis and Synthesis : 4 Credits (3 – 1 – 0)

Unit I	Review of Network Theorems, Formulations of network equations: First –order systems, Natural response, Initial conditions, complete response of First- order systems, zero state and zero input responses. Second order system, Natural response, Overdamped, Underdamped and critically damped case. Geometry of plane, unit-step and unit impulse response, linear system with sinusoidal inputs, impedance and admittance, power, concept of Complex frequency.	12 lectures
Unit II	Transform Impedances Network functions of one port and two port networks, concept of poles and zeros, properties of driving point and transfer functions, time response and stability from pole zero plot, frequency response. Characterization of LTI two port networks ZY, ABCD and h- parameters, reciprocity and symmetry. Inter- relationships between the parameters, inter- connections of two port networks.	9 lectures
Unit III	Positive real function; definition and properties; properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms.	11 lectures
Unit IV	Graph of a Network, definitions, tree, co tree , link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix Duality, Loop and Node methods of analysis.	10 lectures

Recommended books :
1. " Network Analysis", M.E. Van Valkenburg, Prentice Hall of India
2. "An Introduction to Circuit analysis: A System Approach" Donald E. Scott McGraw Hill Book Company.
3. 'Circuit Theory" A.Chakrabarti, Dhanpat Rai and Co.
4. "Networks and Systems" D.Roy Choudhary, Wiley Eastern Ltd.
5. "Engineering Circuit analysis" W.H. Hayt and Jack E-Kemmerly, Tata McGraw Hill.
6. Linear Circuits, Ram Kalyan, Oxford University Press.

EC 4251 Computer Hardware and Peripherals : 3 Credits (1 – 0 – 4)

Unit I	History of computing and generation of microprocessor	2 lectures
Unit II	Inside the PC: CPU, Memories, PC Expansion Buses, system clock	3 lectures
Unit III	Power supply, keyboard, mouse, monitor	2 lectures
Unit IV	Controllers: Video adapters, Hard disk drive controller, Floppy disk controller, parallel interface, USB.	3 lectures
Unit V	Modem and communication ports, sound boards, graphics card. Trouble shooting of PC-	4 lectures

Recommended books :

1. Troubleshooting and Maintenance of PC's Mark Minasi (BPB Publication)
2. Troubleshooting and Maintenance of PC's Peter Norton (BPB Publication)

EC-4299 Project (Diploma) : 3 Credits (0 – 0 – 6)

Task	Performance indicators	Good 4	Satisfactory 3	Average 2	Poor 1
Selection of Topic		Selection of the topic by referring literature and discussion with guide in two weeks. Splitting the project into small tasks and scheduling them to finish it in time and division of the work among the members of the team is good and coordination in the team is good.	Selection of the topic by referring research journals in a month Splitting the project into small tasks and scheduling them to finish it in time and different tasks of the job shared among the members of the team with satisfactory coordination. Collected related research articles are satisfactory for the project work. Work completed 80%. Can start preparing the dissertation.	Selection of the topic by referring research journals in more than a month Splitting the project into small tasks is not sufficient and sharing different tasks among the team members needs some more attention Need some more research articles for the project work and need time.	Selection of the topic with the help of the guide Not able to split the project into small tasks. Needs lot of work to be done. Not collected relevant articles. Work not completed. Need lot of attention.
Literature Survey	Selection of Topic				
Performance of the task	Developing Project Plan & Distribution of work				
Review					
Viva-voce					
	Collection of Literature				
	Experiment / Analysis/ Industrial Problem	Work completed in all aspects and is ready to prepare the dissertation. Coordinates team efforts and communication among members is good.	Coordinates team efforts and communication among members is satisfactory. Presentation is satisfactory with the results.	Work completed only 50-60%. Need more attention to compete the tasks. Requires more coordination and communication among the team	No proper coordination among the team Presentation in incomplete in all aspects.
	Team Work	Presentation should be good with results and with good figures Understanding the task fully. Knowing all the tasks of the project, 100%.	Ability of correlating the theoretical aspects with the practical aspects is in between 60-80% Dissertation prepared with neat sketches, and complete with all the necessary calculations or analysis, contents of the dissertation are well planned and coverage of all the topics is satisfactory	Presentation needs some improvement Ability of correlating the theoretical aspects with the practical aspects is in between 50-60% Dissertation prepared with sketches and	Ability of correlating the theoretical aspects with the practical aspects is less than 50% Dissertation prepared is not complete in all aspects and the coverage of all the contents is poor
	Presentation				
	Understanding				
	Dissertation Preparation	Dissertation prepared with neat sketches, and complete with all the necessary calculations or analysis, contents of			

Understanding	the dissertation are well planned and coverage of all the topics is good Answering 100% questions related to the project	Answering 80% questions related to the project Responding and answering to the satisfactory level	required calculations but needs improvement Answering about 60% of questions related to the project Responding with much delay and answering about 50% of the questions	Answering less than 50% of the questions related to the project Not able to respond. Understanding the concepts is poor
Response	Responding immediately with confidence			

EC-4001   Video and Advanced TV Engineering : 4 Credits (3 – 1 – 0)

Unit I	**Fundamentals of television**: Geometry form and Aspect Ratio, Image Continuity, Number of scanning lines, Camera tubes, Image orthicon - vidicon-plumbicon-silicon diode array, Monochrome picture tubes, Composition- vertical sync, Picture signal transmission: Positive and negative modulation, VSB transmission, Sound signal transmission, Standard channel bandwidth.	9 lectures
Unit II	**Monochrome television transmitter and receiver:** TV transmitter, TV transmission Antennas, Monochrome TV receiver, RF tuner, UHF, VHF tuner, Digital tuning techniques: AFT-IF subsystems, Video and sound inter carrier detection, Video amplifier circuits, Deflection current waveform, Deflection Oscillators - Frame deflection circuits, EHT generation - Receiver Antennas.	9 lectures
Unit III	**Essentials of colour television:** Compatibility, Colour perception, Three colour theory, Colour television cameras, Colour television display tubes, Colour picture tubes, Pincushion correction techniques: Automatic degaussing circuit, Grey scale tracking, Colour signal transmission, Weighting factors, Formation of chrominance signal.	08 lectures
Unit IV	**Colour television systems:** NTSC colour TV system, PAL colour TV system: Cancellation of phase errors, PAL -D colour system, PAL coder, Colour burst separation, Burst phase Discriminator, Reference Oscillator, Ident and colour killer circuits, Merits and demerits of the PAL system, SECAM system: Merits and demerits of SECAM system.	9 lectures
Unit V	**Advanced television systems:** Satellite TV technology, Cable TV, Tele Text broadcast receiver, Digital television: Transmission and reception, Projection Television: Flat panel display TV receiver, Sterio sound in TV, 3D TV, EDTV, Digital equipments for TV studios.	7 lectures

Recommended books :
1. Monochrome Television Practice, Principles, Technology and servcing, R.R.Gulati, Second edition, New age International Publishes, 2004
2. Monochrome and colour television, R.R.Gulati, New age Internationl Publisher, 2003
3. Television and Video Engineerign, A.M Dhake, Second edition, TMH, 2003.
4. Colour Television, Theory and Practice, S.P.Bali, TMH, 1994

EC-4002   Instrumentation and Process Control : 4 Credits (3 – 1 – 0)

Unit I	Fundamental Concept of Instrumentation: Definition of terms, calibration, standards, dimensions and units, basic concepts in dynamic system response, distortion, impedance matching. Causes and types of experimental errors, error analysis on a common sense basis uncertainty analysis and propagation of uncertainty.	8 lectures
Unit II	Measurement of Physical Parameters: Introduction to Transducer and types. Measurements of temperature, pressure, relative humidity, moisture content, velocity and flow.	12 lectures
Unit III	Introduction to process Control: Process-Control Principles, Servomechanisms. Process-control block diagram, control system evaluation	10 lectures
Unit IV	Data Acquisition: Analog Data, Digital Data, Pneumatic data, ON/OFF Control, Analog Control, Digital Control, Direct Digital Control (DDC), Programmable Logic Controllers, Analog Data Representation, Process-Control Drawings	12 lectures

Recommended books :
1. Experimental Methods for Engineers, J. P. Holman Eighth Edition, McGraw Hill International.
2. Process Control Instrumentation Technology, Curtis D. Johnson, Eighth Edition, Pearson New International Edition.

3. Principles of Industrial Instrumentation, D. Patranabis, Second Edition, Tata McGraw-Hill Education.
4. Industrial Instrumentation and Control, Donald P. Eckman, Third Edition, Wiley Eastern Ltd, New Delhi.

EC-4003   Transducer and signal conditioning : 4 Credits (3 – 1 – 0)

Unit I	Introduction: Basic concepts, Definition and classification of transducers, active and passive transducer, Causes and types of experimental errors, error analysis.	8 lectures
Unit II	Transducer : Variable Resistance, capacitance, Inductance transducers, construction, working principle, selection criteria and application of Potentiometer, strain gauge, load cell, Thermistors, Thermocouple, Induction potentiometer, Linear variable differential transformer, Capacitance pick up, Piezoelectric Transducers advantages, disadvantages and limitations	12 lectures
Unit III	Special transducers: Transducers based upon Hall Effect, Optical transducers-photo diode, photo transistor LOR, and LED, Digital transducer-single shaft encoder, Techo generator, Advantage and disadvantage and limitations	10 lectures
Unit IV	Principle of analog and digital signal conditioning : Linearization, Various types of conversions (V to F, F to V, V to I converters and I to V converters),Filtering and impedance matching, A/D conversion, D/A conversion, Multiplexer/ Demultiplexer, Encoder/Decoder, Sample and hold Data Acquisition system (DAS)	12 lectures

Recommended books :
1. Industrial Instrumentation and Control, Donald P. Eckman, Third Edition, Wiley Eastern Ltd, New Delhi.
2. Electrical and Electronics Measurement and Instrumentation by A.K. Shawney, Dhanpat Rai and Co., New Delhi
3. Experimental Methods for Engineers, J. P. Holman Eighth Edition , McGraw Hill International.
4. Process Control Instrumentation Technology, Curtis D. Johnson, Eighth Edition, Pearson New International Edition.
5. Principles of Industrial Instrumentation, D. Patranabis, Second Edition,Tata McGraw-Hill Education.

EC-4004   Medical Electronics : (3 – 1 – 0)

Unit I	Anatomy and physiology: Elementary ideas of cell structure, Heart and circulatory system, Central nervous system, Muscle action, Respiratory system, Body temperature and reproduction system.	8 lectures
Unit II	Overview of Medical Electronics Equipments, classification, application and specifications of diagnostic, therapeutic and clinical laboratory equipment, method of operation of these instruments.	8 lectures
Unit III	Electrodes: Bioelectric signals, Bio electrodes, Electrode, Electrode tissue interface, contact impedance, Types of Electrodes, Electrodes used for ECG, EEG.	9 lectures
Unit IV	Transducers: Typical signals from physiological parameters, pressure transducer, flow, transducer, temperature transducer, pulse sensor, respiration sensor.	8 lectures
Unit V	Bio Medical Recorders and Patient Monitoring Systems: Block diagram description and application of following instruments, ECG Machine, EEG Machine, EMG Machine. Heart rate measurement, Pulse rate measurement, Respiration rate measurement, Blood pressure measurement.	9 lectures

Recommended books :
1. Handbook of biomedical Instrumentation by RS Khandpur
2. Biomedical Instrumentation by Cromwell,
3. Modern Electronics Equipment by RS Khandpur, TMMH, New Delhi
4. Introduction to BioMedical Electronics by Edward J. Perkstein; Howard Bj, USA

EC-4005   Basic Satellite Communication : 4 Credits (3 – 1 – 0)

Unit I	Orbital mechanics: Orbital perturbations, Azimuth & elevation angle calculations, limits of visibility, eclipse, sun-transit outage, launches and launch vehicle.	9 lectures
Unit II	Spacecraft systems: Attitude and Orbit control system, Telemetry, tracking and command (TT&C), communications subsystems, Transponders, Spacecraft antennas.	9 lectures
Unit III	Earth Segments: Earth station antennas, Amplifiers, Converters, Reliability, Basic transmission theory of satellite link, noise figure and noise temperature, satellite uplink and down link analysis, Propagation on Satellite-Earth Paths and its Influence.	12 lectures
Unit IV	Satellite Access and Applications: Analog telephone transmission, FM theory, FM Detector theory, analog TV transmission, Digital transmission- base band and band pass transmission of digital data, BPSK, QPSK, PCM, Access techniques: FDMA, TDMA, CDMA, Encoding & FEC for Digital satellite links.	12 lectures

Recommended books :

1.   Satellite communication, Timothy Pratt, Charles W. Bostian, John Wiley & sons, Publication, 2003 .
2.   Digital Satellite Communications, Tri T. Ha, 2nd Edition, Tata McGraw Hill
3.   Satellite Communication, Dennis Roddy, 4th Edition, Mc Graw Hill International, 2006
4.   Satellite Communication Systems Engineering, Wilbur L.Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, Prentice Hall/Pearson, 2007
5.   The Satellite Communication Applications, Bruce R. Elbert, Hand Book, Artech House Bostan London, 1997.

Department of Mechanical Engineering
Programme: Diploma in Mechanical Engineering

Year I : **SemesterI**

			L	T	P	C
HS	3101+	Communication Skill	2	0	2	3
PH	3102+	Physics-III B	2	0	2	3
CY	3101+	Chemistry-III	3	0	2	4
MA	3101	Engineering Mathematics-I	3	1	0	4
ES	3100	Object Oriented Programming with C++	2	0	4	4
ME	3101	Production Engineering-I	3	0	0	3
ME	3102	Thermodynamics	3	1	0	4
ME	3103*	Comprehensive Mechanics	3	1	0	4
ME	3151*	Comprehensive Workshop - I	0	0	6	3
ME	3152*	Comprehensive Mechanical Drawing	0	0	6	3
			18	2	10	25 /10+2

(Voc)//NERIST

* Bridge for 10+2 PCM.

14	3	16	25 10+2 PCM

+ Bridge for 10+2Vocational/NERIST Certificate

Year I : **SemesterII**

ES	3200	Environment and Ecology	3	0	0	3
PH	3202	Physics IV B	2	0	2	3
CY	3202	Engineering Chemistry IA	3	0	2	4
MA	3201	Engineering Mathematics-II	3	1	0	4
ME	3201	Fundamentals of Fluid Mechanics	3	1	0	4
ME	3202	Production Engineering - II	4	0	0	4
ME	3251	Workshop Practice	0	0	6	3
EC	3277*	ElectronicsEngineering	3*	0	0	3*
			18+3*	2	10	25+3*
						(Audit)

*Audit Course

Year II : **SemesterI**

			L	T	P	C
EE	4122	Fundamentals of Electrical Engineering	3	0	2	4
ME	4101	Theory of Machines	4	0	0	4
ME	4102	Energy Conversion Principles	4	0	0	4
ME	4103	Strength of Materials	4	0	0	4
ME	4104	Fluid Machines	3	0	2	4
ME	4151	Machine Drawing	0	0	6	3
ME	4152	Experimental MethodsandMeasurements	2	0	4	4
			20	0	14	27

Year II	:		SemesterII				
HS	4201		Principles of Economics & Costing	4	0	0	4
CE 4	226		Basics of Civil Engineering	3	0	2	4
ME	4201		Production Cost and Quality Management	4	0	0	4
ME	4202		Design of Machine Elements	3	1	0	4
ME	4203		Engineering Metallurgy	4	0	0	4
ME	40**		Elective	4	0	0	4
ME	4299		Project	0	0	6	3
ED	4288		ExtraCurricularactivities	-	-	-	2
				22	**1**	**8**	**27+2(ED)**

List of Electives

ME	4001	Automobile Engineering	ME 4004	Statistical Quality Control
ME	4002	Non Traditional Machining	ME 4005	Control Systems
ME	4003	Total Productivity Management	ME 4006	Solar Energy Engineering

Courses offered to branches other than ME only

ME3153	Comprehensive Workshop - II	0	0	6	3	CE (L)
ES3277*	Comprehensive Workshop - III	0	0	6	3	EC (L)+EE(L)
ME4121	Principles of Mechanical Engineering	3	1	0	4	CE

COURSE CONTENTS

ME 3101: Production Engineering – I : 3 Credits (3-0-0 3)		
Unit I	Introduction to basic manufacturing processes: Metal casting and castability, metal joining and weldability, metal cutting and machinability, metal forming and formability.	6 lectures
Unit II	Pattern making: Types of patterns, pattern allowances, pattern materials; Moulding and core making; Organic and inorganic binders, moulding materials & their properties; Moulding processes and core making, melting furnaces, fettling and heat treatment of castings, inspection, casting defects.	12 lectures
Unit III	Plastic deformation of metals: Deformation by slip and twinning, hot/warm forming, cold forming, rolling, forging, drawing, shearing, punching, coining and extrusion; Punch and dies, presswork operations.	12 lectures
Unit IV	Classification of welding processes and applications: Arc welding, TIG welding, MIG welding, gas welding, soldering and brazing, adhesive bonding, friction welding.	12 lectures

Recommended Books :

1. Manufacturing Technology (Vol. I), P.N.Rao, McGraw Hill Education Pvt. Ltd., 2007.
2. Production Engineering Sciences, P.C.Pandey & C.K.Singh, Standard Book Publishers, 2011.
3. Elements of Workshop Technology (Vol I & II), S. K. Hajra Choudhary, AK Hajra Choudhary and N. Roy, Media Promoters & Publishers Pvt. Ltd., 2007.
4. Manufacturing Science, A. Ghosh & A. K. Mallick, East West Press, 1993.
5. Welding Processes and Technology, R. S. Parmar, Khanna Publishers, 2003.

ME 3102: Thermodynamics: 4 Credits (3-1-0)		
Unit I	Introduction of thermodynamics with its application in real systems, power plant, IC engine, rocket propulsion, refrigerator, macroscopic and microscopic view point, thermodynamic system, thermodynamic properties. thermodynamic equilibrium, processes, continuum, specific volume, pressure, Zeroth law of thermodynamics, point function, path function, work and heat, first law of thermodynamics, first law for flow process.	7 lectures
Unit II	Second law of thermodynamics, limitations of first law, heat engine, heat pump, energy reservoir, Kelvin-Planck statement, Clausius Statement, reversible process, irreversible process, Carnot cycle, Carnot's theorem, corollary of Carnot's theorem, temperature scale, entropy, Clausius' theorem, F-S plot. Clausius inequality, entropy change in an irreversible process, entropy principle.	8 lectures
Unit III	Properties of pure substance, P-V diagram for different phaseser substance, critical temperature, triple point, properties of pure substance, T-S diagram, h-s diagram, dryness fraction, saturated liquid, saturated vapour, independent properties; Introduction to steam table, Mollier chart, law of corresponding states, Dalton's law of partial pressure, equivalent gas constant, entropy of gas mixture.	6 lectures
Unit IV	Availability, classification of high grade energy and low grade energy, availability in a steady flow process, availability in a non-flow process, availability in chemical reaction, Maxwell's Equation, Tds equations, Cp, Cv relations; Joule-kelvin effect, Clausius-Clapeyron equation, evaluation of latent heat by Clausius-Clapeyron equation, Trouton's rule, evaluation of thermodynamic properties from an equation of states, Gibbs phase rule, Gibbs-Duham equation for the mixtures of variable composition.	7 lectures

Unit V	Introduction of air vapour power cycle, air standard cycle, Otto, Diesel, Dual, Stirling, Ericson, Atkinson, and Brayton cycles.	7 lectures
Unit VI	Introduction to heat transfer: Fourier's law of heat conduction, thermal conductivity, resistance concept in heat conduction, transient heat conduction with lump heat capacity method, Newton's law of cooling, concept of free, forced convection and radiation.	7 lectures

Recommended Books

1. Engineering Thermodynamics, P. K. Nag, Tata McGraw Hill, 2005.
2. Engineering Thermodynamics Work and Heat Transfer, G. F. C. Rogers and Y. R. Mayhew, 4th Ed., Pearson, 2001.
3. Fundamentals of Thermodynamics, Borgnakke and Sontag, Wiley, 2003.
   Heat and Thermodynamics, Zemansky, Tata McGraw Hill, 2011

ME 3103: Comprehensive Mechanics: 4 credits (3-1-0)		
Unit I	Mechanics and its relevance to engineering, inertia and moving frame of reference, free body diagrams, internal and external forces, laws of mechanics, concept of moment, equilibrium principle.	6 lectures
Unit II	Simple structure: Type of structures/truss, analysis by the method of joints and method of sections.	6 lectures
Unit III	Static analysis of systems with friction: friction in impending motion, rolling resistance, sliding and rolling of cylinders.	6 lectures
Unit IV	Centroids, centre of mass, centre of gravity, first moment, centroid of length, centroid of an area, theorem of Pappus and Guldinus, centroid of volumes, moment of inertia, parallel axis and perpendicular axis theorems, moment of inertia of composites sections.	8 lectures
Unit V	Kinematics of rigid body: Types of motion, fixed axis rotation, plane motion of a rigid body, instantaneous centre of rotation, relative velocity and acceleration for points on a rigid body.	8 lectures
Unit VI	Dynamics of rigid body: D'Alembert's principle, translation of a rigid body, rotation of a rigid body about a fixed principal axis, plane motion of a rigid body, general motion of a rigid body, projectile and SHM, impact of two bodies: elastic and inelastic collision, co-efficient of restitution.	8 lectures

Recommended Books

1. Engineering Mechanics, J. L. Meriam and L. G. Kraige, John Wiley & sons, 7th Ed., 2012.
2. Engineering Mechanics, S. Timoshenko, McGraw Hill Publishers, 5th Ed., 2013.
3. Engineering Mechanics, I.H. Shames and G.K.M. Rao, Pearson Education India, New Delhi, 4th Ed., 2006.
4. Engineering Mechanics, R. K. Bansal, Laxmi Publication, 4th Ed., 2016.

ME 3151: Comprehensive Workshop - I: 3 Credits (0-0-6)	
Fitting Shop: Introduction to fitting and safety aspects; use of different tools (functions, types and specifications), filling operations, drilling. Practice simple fitting jobs.	28 hours
Carpentry Shop: Introduction to carpentry and safety aspects; use of different tools (functions, types and specifications) types of woods, hand tools and wood working machines. Practice simple carpentry joints.	28 hours
Welding Shop: Introduction to gas and arc welding and safety aspects; use of different tools (functions, types and specifications), soldering and brazing practice. Practice of welding joints.	28 hours

ME 3152: Comprehensive Mechanical Drawing: 3 credits (0-0-6)	
Manipulating and use of drawing equipment and instruments, lines, dimensioning, geometrical constructions, engineering curves.	18 hours
Projection of points, lines, planes and solids (orthographic).	18 hours
Isometric projections.	12 hours
Introduction to limits, fits and tolerances, assembly elements.	18 hours
Sectional views, conventional symbols used in drawing, free hand sketching reading of drawing.	18 hours

Recommended Books:

1. Engineering Drawing (Geometrical Drawing), P.S. Gill, Katson Books, S.K.Kataria & Sons,2013.
2. Engineering Drawing, N. D. Bhatt & V.M.Panchal, Charotar Publishing House, 53rd Ed., 2014.
3. Machine Drawing, N. Siddeswar, Tata McGraw Hill, 1990.
4. Machine Drawing, K. L. Narayana, New Age International Publication, 4th Ed., 2010.

ME 3201: Fundamentals of Fluid Mechanics: 4 Credits (3-1-0)		
Unit I	Introduction to fluid mechanics: Characteristics of fluids, continuum principle, units & dimensions, different fluid properties, classification of fluids, different types of flow (steadiness, uniformity and dimensionality of flow: laminar & turbulent flow), control volume & system approach. Fluid statics: Pressure variation with position in static mass of fluid, pressure measurement – barometer, manometers & pressure gauges, hydrostatic thrust on immersed plane & curved surfaces, centre of pressure, buoyancy, metacentre, stability & equilibrium of immersed and floating bodies.	11 lectures
Unit II	Introduction to kinematics of fluids: Velocity & acceleration, rotational & irrotational flow, circulation & vorticity, flow characteristics – streamline, streakline and pathline, velocity potential & stream function, flow net, basic flows and the corresponding velocity potential & stream functions.	6 lectures
Unit III	Fluid dynamics: Fundamental & subsidiary governing equations, continuity equation, Reynolds equation, Navier-Stoke's equation (statement only), Euler's equation of motion, Bernoulli's equation and its application, pitot tube, venturimeter, nozzle & orifice, momentum and kinetic energy, correction factor, total energy line & hydraulic grade line, momentum equation & its applications.	10 lectures
Unit V	Laminar & turbulent flows: Flow between fixed and moving parallel plates, flow through circular pipes, flow through annulus, shear stress & velocity distribution, turbulent flow in pipes, different losses for flow through pipes, Darcy-Weisbach equation, Moody's diagram, pipes in series & parallel, power transmission through pipes.	7 lectures
Unit VI	Reynolds's transport equation and its application to different kinds of fluid machines, impulse-momentum principle, angular momentum conservation principle, impact of jets on (i) plane (stationary, inclined & moving plate) and (ii) curved plates with jet strikes tangentially, series of vanes, Force exerted, work done, and efficiency. Dimensional analysis: Dimensional homogeneity, Buckingham-π theorem, important dimensionless parameters & their significance, definitions of geometric, kinematic & dynamic similarities, introduction to model testing.	8 lectures

Recommended Books:

1. Fluid Mechanics, J.F. Douglas, J.M. Gasiorek, J. A. Swaffield and L.B. Jack, Pearson Education, 2008.

2. Introduction to Fluid Mechanics and Fluid Machines, S. K. Som, G. Biswas, Tata McGraw Hill, 2nd Ed., 2003.

3. Fluid Mechanics, F. M. White, Tata McGraw Hill, 6th Ed., 2008.

4. Introduction To Fluid Mechanics, R.W. Fox, A.T. McDonald and P.J. Pritchard,, John Wiley, 6th Ed. 2004.

5. Fundamentals Of Fluid Mechanics, B.R. Munson, D.F. Young, and T.H. Okhiishi, Wiley India Edition, 5th Ed., 2002.

ME 3202: Production Engineering-II : 4 Credits (4-0-0)		
Unit I	Fundamentals of metal cuttings: Generactics/directics, surface generations, orthogonal and oblique cutting, characteristics of cutting tool materials, tool geometry, tool signature: ASA and ORS system, process parameters, evaluation of cutting speed, tool life and cutting forces, mechanism of chip formation. parameters that affect chip formation and tool life, cutting fluids.	12 lectures
Unit II	General purpose machine tools: Lathe/milling/shaping/grinding and its constructions/mechanisms and features, various machining operations: lathe operations, milling operations, shaping, planning and grinding, measurement of surface roughness and force analysis, grinding wheel specification.	14 lectures
Unit III	Gear cutting in milling, indexing, spur and helical gear cutting, gear shaping, gear hobbing, thread rolling, introduction to jigs and fixtures, principles of work holding, jigs and fixtures used for common machining operations.	10 lectures
Unit IV	Newer and advanced machining processes: Working principles and their applications, merits and demerits of the processes USM, ECM, EDM, WJM, WEDM, LBM, EBM.	10 lectures
Unit V	Introduction to numerical control, NC and CNC, classifications, PTP and contouring, G and M codes, manual part programming for lathe, drilling and milling operations.	10 lectures

Recommended Books:

1. Manufacturing Scienc, A. Ghosh & A. K. Mallick, East West Press, 1993.
2. Fundamentals of Metal Machining and Machine Tools, G.Boothoyd., CRC Press,1988.
3. Manufacturing Technology: Metal Cutting & Machine Tool, P. N. Rao, McGraw Hill Education Pvt. Ltd., 2004.
4. Non conventional Machining, P.K. Misra, Narosa Publishers, 1997.
5. Introduction to Computer numerical control, Barry Leatham,Pitam Publishers, 1989.

ME 3251 : Workshop Practice – I (Machine shop & CIM lab) : 3 Credits (0-0-6)	
Machine Shop: Machine shop practice, practice on preparation of simple jobs involving different operations like turning, threading, boring, shaping, drilling, grinding and milling, demonstration on milling/lathe attachments, copying mechanism, WEDM, single spindle automats.	24 hours
CIM Lab: CNC Lathe Machine, understand operation procedures of the machine, demonstration of operating procedure with the help of a work piece, understand safety operations. CNC Milling Machine, understand operation procedures of the machine, demonstration of operating procedure with the help of a work piece, understand safety operations.	36 hours
Computer lab: CAM practice, demonstration, switch on/off procedure, part program and its simulation/dry run, demonstration of making sample job involving different operations.	24 lectures

Syllabi of courses offered to other departments only

ME 3153: Comprehensive Workshop – II: 2 Credits (0-0-4) [For CE (L) students]	
Carpentry Shop: Introduction to woodworking and safety aspects in the shop, types of tools (functions, and specifications), equipment and operations, type of woods, carpentry joints.	28 hours
Fitting Shop: Introduction to fitting shop and safety aspects in the shop, type of tools (functions and specifications), equipment and operations, fitting jobs.	28 hours

ES 3277: Comprehensive Workshop – III : 3 Credits (0-0-6) [For EC(L) & EE(L) students]	
Fitting Shop: Introduction to fitting and safety aspects and different tools (functions and specifications), filling operations, drilling, simple fitting jobs.	28 hours
Carpentry Shop: Introduction to carpentry and safety aspects and different tools (functions and specifications), type of woods, hand tools and wood working machines, carpentry joints.	28 hours
Welding Shop: Introduction to gas and arc welding, safety aspects, different tools (functions and specifications), soldering and brazing practices, welding joints.	28 hours

ME 4101: Theory of Machines: 4 credits (4-0-0)		
Unit I	Kinematics and kinetics, mechanism and structures and their inversions, elements of kinematics chain, miscellaneous types of mechanism, kinematics fundamental, degree of freedom and its determination, lower pairs and higher pairs, types of motions, links, joints and kinematics chains, inversions, Grasshoff's law.	10 lectures
Unit II	Velocity analysis and rigid body mechanics, graphical analysis, instantaneous centers, velocity analysis of instantaneous centers, centroids.	8 lectures
Unit III	Analytical solution of velocity analysis: Four bar linkages, velocity analysis of bars, slider crack of mechanism, Whitworth quick return mechanism.	8 lectures
Unit IV	Acceleration analysis: Definition of acceleration of mechanism, graphical analysis, analytical solution of acceleration analysis; four bar linkages, slider crack mechanism, Coriolis acceleration, acceleration of n bars.	8 lectures
Unit V	Belt and chain drives, friction and centrifugal clutches, brakes and dynamometers,	12 lectures
Unit VI	Gear Trains: Rolling cylinder, fundamental law of gearing, involute tooth from pressure angle, simple gear train, compound gear train, epicyclic gear train, or planetary gear trains, transmissions.	10 lectures

Recommended Books:

1 Theory of Machines, S.S. Rattan, Tata McGraw Hill, 4th Ed., 2014.
2. Theory of Machines, T. Beven, CBS Publications, 3rd Ed., 2005.
3. Design of Machinery, R.L.Nortan, Tata McGraw Hill, 4th Ed., 2008.
4. Theory of Machines & Mechanism, J.E. Shigley, McGraw Hill, 3rd Ed., 2009.

ME 4102 : Energy Conversion Principles: 4 Credits (4-0-0)		
Unit I	Principles of thermo–mechanical energy conversion, IC & E.C. engines, gas turbines, steam turbines, combustion process, fuels, combustion reactions, complete and incomplete combustion, calculation of air requirement, theoretical and actual air-fuel ratios, flue gas analysis, combustion in boilers.	10 lectures
Unit II	IC Engines: Classification of IC engines, two stroke, four stroke engines, spark ignition (S.I.) engines, compression ignition (C.I.) engines, carburetion and fuel injection systems, cooling system of IC engines, multi-cylinder engines, indicated and brake power, brake mean effective pressures, engines efficiencies, performance analysis of IC engines, testing of IC engines, testing of IC engines, heat balance.	8 lectures
Unit III	Steam Power Systems: Components of steam power systems, Rankine cycle & modified Rankine cycle, steam generators- introduction and classification, FTB & WTB, mountings and accessories of boiler, boiler performance (Introduction only).	13 lectures
Unit IV	Gas Turbines: Closed and open cycles, basic closed cycles, analysis of Brayton or Joule cycle, machine efficiencies, optimum pressure ratio for maximum cycle output, optimum pressure ratio for maximum thermal efficiency, gas turbine cycle with heat exchanger or generator, gas turbine cycles with inter-cooling and reheating.	8 lectures

Unit V	Introduction to Jet propulsion: Specific thrust-thermal efficiency, propulsive efficiency and ram efficiency of jet plane, multi-shaft system turbines in series, an advanced automative gas turbine engine concept.	8 lectures
Unit VI	Reciprocating Air Compressors: Introduction and working principles with constructional details, single stage compressor, equation of shaft work isothermal adiabatic, efficiency, clearance and clearance volume equation of work with conventional p-v diagram, volumetric efficiency, influenceof polytropic index on mass flow rate and power of compressor, multistage reciprocating air compressor intercooler, mean effective pressure and indicated power, mechanical efficiency, air motor, control of compressor	9 lectures

Recommended Books

1. Principles of Energy Conversion, A.W. Cupl, MGH, New York, 1991.
2. Energy Conversion: (Vol. I,II & III), V. kadamni and M. Prasad, Tata McGraw Hill, 1976.
3. Internal Combustion Engine Fundamentals, J. B. Heywood, Tata McGraw Hill, 1988.
4. Power Plant Engineering, P.K. Nag, Tata McGraw Hill, 2nd Ed., 2003.
5. Thermal Engineering, R.K. Rajput, Laxmi Publication Pvt. Ltd., 2006.
6. Engineering Thermodynamics (Priciples and Practice), D.S. Kumar , S.K. Kataria & Sons, 2015.

ME 4103: Strength of Materials: 4 credits (4-0-0)		
Unit I	Stresses and strains, elasticity, Hooke's law, Poisson's ratio, volumetric strain, elastic constants, constitutive relations, material properties for isotropic materials and their relations, stresses in composite bars, strain energy impact and suddenly applied loads, thermal stresses.	12 lectures
Unit II	Principal stresses and their planes, plane of maximum shear, Mohr's circle of stresses, theories of failures for isotropic materials.	10 lectures
Unit III	Shear force and bending moment diagrams for beams subjected to different types of loads.	10 lectures
Unit IV	Bending of beams: Theory of simple bending and assumptions, stresses due to pure bending, transverse shear stress distribution, combined stresses due to bending, torsion and axially loading with eccentricity.	7 lectures
Unit V	Deflection of beams: Double integration method, the moment area method, Macaulay's method, superposition (statically determinate beams only), Castigliano's theorem.	7 lectures
Unit VI	Torsion of shafts and buckling of columns.	10 lectures

Recommended Books:

1. Strength of Materials, G. H. Ryder, McMillan, ELBS Edition, 3rd Ed.,1985.
2. Mechanics of Materials, S. Timoshenko, and M. J. Gere, C.B.S, Publishers, 1980.
3. Strength of Materials, B.C.Punmia, Firewall Media, 2002
4. Engineering Mechanics of Solids, E. P. Popov, PHI, New Delhi, 2nd Ed., 2012.

ME 4104 : Fluid Machines: 4 Credits (3-0-2)		
Unit I	Reynolds transport equation and its application to different kinds of fluid machines.	6 lectures
Unit II	Impulse momentum principle, angular momentum conservation principle, impact of jets on plane (stationary, inclined & moving plate) and curved plates with jet strikes tangentially, series of vanes, force exerted, work done, and efficiency.	8 lectures
Unit III	Centrifugal pump and its classification, components & working principle, velocity triangles, head developed, work done, losses, efficiencies and specific speed, pumps in series and parallel, NPSH, priming, cavitation, performance characteristics. Reciprocating pump and its classification, working principle, indicator diagram, discharge, head developed and power, effect of acceleration of piston, friction on pipes and maximum pump speed, air vessels, power saved.	10 lectures
Unit IV	Hydraulic turbines and its classification, impulse turbine, Pelton wheel, analysis of force on the buckets, work done, power generation and efficiencies. Reaction turbines, Francis turbine, work done, runner design, and efficiencies Kaplan turbine and Francis turbines, governing of turbines, draft tubes, cavitation, performance characteristics, comparison of specific speeds of hydraulic turbines.	10 lectures
Unit V	Miscellaneous hydraulic machines, construction and working principles of gear pump & screw pump, fluid coupling and torque converter, hydraulic ram, accumulator, hydraulic jack.	8 lectures

Recommended Books :

1. Fluid Mechanics and Hydraulic Machines, R. K. Bansal, Laxmi Publications, 2005.
2. Fluid mechanics and Hydraulics, J. Lal, Metropolitan New Delhi, 9th Ed., 1991.
3. Fluid Mechanics & Fluid Machines, S.K. Som & G. Biswas, McGraw Hill Education, 3rd Ed., 2012.
4. Fluid Mechanics and Thermodynamics of Turbomachinery, S. L. Dixon, Elsevier, 5th Ed., 1998.

ME 4151: Machine Drawing : 3 Credits (0-0-6)	
Conventional drawing and drafting: Classification of machine drawing, assembly and parts drawing, parts listing, assembly drawing from detailed drawing, power transmission unit, machine tools parts, tool drawing and miscellaneous parts, toleranced dimensional drawing, exercises involving use of ISI conventions in drawing.	42 hours
Computerized drafting techniques: Introduction of Autocad and other drafting and solid modeling packages viz. mechanical desktop, Creo (Pro-e) Catia, basic command, drawing, sectional views, simple figures, dimensioning, sectional views, three dimensional drawing.	42 hours

Recommended Books

1. Engineering Drawing, N. D. Bhatt, Charotar Publishing House, 53rd Ed., 2014.
2. Machine Drawing, K. L. Narayana, New Age International, 4th Ed., 2013.
3. Production Drawing, K. L. Narayana, New Age International, 2009.
4 .AutoCAD/Creo/Catia Manual.

ME 4152 : Experimental Methods : 4 Credits (2-0-4)		
Unit I	Planning of experiments, error analysis.	4 lectures
Unit II	Classification of instruments, their characteristics, instruments used to measure flow, temperature, velocity & pressure.	6 lectures
Unit III	Measurement of threads, angles & surface roughness, limit gauges, comparators	5 lectures
Unit IV	Calibration of instruments: Methods & analysis.	4 lectures
Unit V	Material properties for metals & non metals.	5 lectures
Unit VI	Behavior of linear spring, rotating masses and various mechanisms	4 lectures
Practice	IC Engine Lab (14 hours), Thermal Engineering Lab & Metrology Lab (14 hours), Strength of Material Lab (14 hours) and Dynamics of Machineries Lab (14 hours).	56 hours

Recommended Books:

1. Experimental Methods, J. P. Holman, MGH, 8th Ed., 2011.
2. Engineering Metrology, R. K. Jain, Khanna Publishers, 3rd Ed., 1975.
3. Mechanical Measurements, T.G. Beckwith & L. Back, Addison Wesely Longman, 1982.
4. Industrial Instrumentation, D.P.Eckman, John, Wiley Eastern Ltd. 1951.

ME 4201: Production Cost and Quality Management : 4 Credits (4-0-0)		
Unit I	Theory of production; manufacturing vs. production, factors of production, types of production, pre-planning, product design and analysis, cost concepts, prime cost, overheads, estimating sales price, cost procedures. Production costs, material and wage calculations, break even analysis.	14 lectures
Unit II	Indirect and direct expenses depreciation and its types, calculating depreciation, materials management and inventory control, material handling, economic order quantity.	10 lectures
Unit III	Project management, network analysis, PERT & CPM, method study, works study, calculation of management, time study, incentives.	10 lectures
Unit IV	Shop floor management, organizational hierarchy, production planning and control, management and operation research.	10 lectures
Unit V	Quality concepts. techniques for product quality analysis, total quality management, quality circles, quality standards, quality planning, characteristics, quality audit & documentation.	12 lectures

Recommended Books

1. Production & Operation Management, J.S. Martinich, Willey Student Edition, 1997.
2. Fundamentals of Quality Control & Improvement, A. Mitra, PHI, 2008
3. Quality Planning & Analysis, J.Juran, Mc Graw Hill Education Pvt. Ltd., 1993.
4 Industrial Engineering and Management, O.P.Khanna, Dhanpat Rai & Sons Publications, 2010.

ME 4202: Design of Machine Elements : 4 Credits (3-1-0)		
Unit I	Introduction to design and its classification, basic design procedure, standards and codes, engineering materials and its classification, stress – strain diagram, selection of failure theories, design of simple machine parts.	6 lectures
Unit II	Design of power screws, knuckle and cotter joints.	8 lectures
Unit III	Design of joints: riveted, bolted and welded joints.	8 lectures
Unit IV	Design of shafts, keys and couplings.	10 lectures
Unit V	Design of helical and leaf springs, belt drives.	10 lectures

Recommended Books

1 Design Data Book of Engineers, PSG College of Technology, Publisher Kalaikathir Achchagam, Coimbatore, 2009.
2 Design of Machine Elements, M.F. Spotts, T.E. Shoup, L.E. Hornberger, S.R. Jayram, and C. V. Venkatesh, Person Education, 8th Ed., 2006
3 Design of Machine Elements, V. B. Bhandari, Tata McGraw Hill, 2nd Ed., 2007.
4 Fundamentals of Machine Component Design, R.C.Juvinall, K.M.Marshek, Wiley, 3rd Ed., 2007.

ME 4203: Engineering Metallurgy: 4 Credits (4-0-0)		
Unit I	Classification of metals and alloys and their engineering applications; properties of metals and alloys, chemical, physical, mechanical and metallurgical.	6 lectures
Unit II	Metal bonds & bond energy, crystallographic structure of materials – unit cells, packing efficiency and coordination number, BCC & FCC, HCP structures, Bragg's law, miller indices, crystallization, recrystallization and grain growth, crystal defects.	7 lectures
Unit III	Iron–carbon equilibrium phase diagram, time-temperature-transformation diagram, heat treatment of steels and cast irons.	11 lectures
Unit IV	Production of iron, steel and their metallurgical properties, smart materials, composite materials, nano materials.	11 lectures
Unit V	Compositions and their applications of cast iron, steels, alloy steels, IS specifications, ceramics manufacturing processes, characteristics and applications.	11 lectures
Unit VI	Non- ferrous metallurgy of aluminium, copper and zinc base alloys, IS specification, powder metallurgy, manufacturing methods and engineering applications.	10 lectures

Recommended Books:

1. Engineering Materials, A.K.Agarwal, McGraw Hill Education Pvt. Ltd., 2003.

2. Principles of Engineering Metallurgy, L.K.Reddy, New Age International Publishers, 2007.

3. Material and Metallurgy, H.S.Bawa, McGraw Hill Education Pvt. Ltd., 1986.

4. Physical Metallurgy, V. Singh, Standard Book Publishers, 2010.

ME 4299: Project: 3 Credits:0-0-6

Students will take up a project work from amongst those floated by the supervisors. The project should preferably be a fabrication type (any mechanical system or small laboratory set up). Students will work on planning / theoretical review / design / material, process and cost estimation / fabrication / testing and analysis of the product with periodical presentation and monitoring under the supervision of guide(s) and project coordinator. A complete detailed report in bound as well as soft forms of requisite numbers are to be submitted to the project coordinator at least seven days prior to final presentation and demonstration duly authenticated by the supervisors / guides. All the students must be present and interact during presentations.

ME 4001: Automobile Engineering: 3 Credits (3-0-0)		
Unit I	Introduction: Classification of automobiles, application, capacity and specifications, parts of an automobile engines, its function & layout, frames, axles, frameless construction, steering system, braking system, power train and drives, clutch, gear box, final drive, propeller shaft, vehicle body, wheels, tyres & tubes.	4 lectures
Unit II	Engine and engine power: Fuels and combustion, air fuel mixture and carburetor, fuel feed systems, fuel injection system, ignition systems, firing order and its significance, knock in CI and SI engines, types of combustion chamber, supercharging and turbocharging.	10 lectures
Unit III	Transmission: Different types of gear box, resistance, variation of the tractive efforts and total resistance with speed, propeller shaft and rear axle, universal joints, final drive, differential, force on rear axle, rear axle drives and supporting, suspension system types, shock absorbers, front axle and steering mechanism & assembly, alignment, steering linkages, characteristics, connections, gear, gear ratio.	8 lectures
Unit IV	Brakes: Introduction, drum, disk, hydraulic, air, mechanical and electric brakes, servo assisted braking system. Clutch: Function, principle of operation and main components of clutches, types of clutches, clutch lining material, lubrication and lubricant, cooling systems.	6 lectures

Unit V	Batteries: Charging system, starting and generating system, ignition systems types, construction & working of battery coil and magneto ignition systems, types and construction of spark plugs, electronic ignition systems, lighting system & accessories. Automotive electronics: Current trends in automobiles, vehicle motion control, crank angle position sensors, fuel metering/vehicle speed sensor and detonation sensor, altitude sensor, flow sensor, throttle position sensors, introduction of electronic fuel injection, ignition systems and digital engine control system.	8 lectures
Unit VI	Automotive air pollution & control: Air pollution, SI and CI engine exhaust, air pollution control techniques, test procedures & instrumentation for emission measurement, emission standards.	6 lectures

Recommended Books:

1. Automobile Mechanics, Crouse, Tata McGraw-Hill, 10th Ed., 2006.
2. Automobile Chassis and body, Crouse, Tata McGraw-Hill, 1985.
3. Automobile Engineering (Vol. I&II), K. Singh, Standard Publishers, 2011
4. A Textbook of Automobile Engineering, R.K.Rajput, LP,2nd Ed.,,2015

ME 4002: Non Traditional Machining: 4 Credits (4-0-0)		
Unit I	Introduction of non-conventional machining, classification and comparative analysis of various processes, special machining processes; EDM and ECM.	12 lectures
Unit II	Abrasive Jet Machining (AJM) & Ultrasonic Machining (USM), machine set up, mechanics, parametric analysis, process capabilities and applications.	9 lectures
Unit III	LBM, working principle, types of laser, process characteristics and applications.	9 lectures
Unit IV	EBM, working principle, process characteristics and applications.	8 lectures
Unit V	Water jet machining, low temperature machining, hot machining.	9 lectures
Unit VI	Chemical machining, electro chemical grinding, deburring, plasma arc machining and metal spraying.	9 lectures

Recommended Books:

1. Advance Machining Processes, V. K. Jain, Allied Publication, 2007.
2. Modern Machining Processes, P.C. Pandey and H.S. Shan, Tata Mc Graw Hill, New Delhi, 1981.
3. Non Conventional Machining Processes, P.K. Mishra, Narosa Pubication, 1997.
4. Unconventional Manufacturing Processes, M.K. Singh, New Age International, 2008.

ME 4003 : Total Productivity Management: 4 Credits (4-0-0)		
Unit I	Definition and classification of productivity, international, national and industrial levels, factors affecting productivity.	9 lectures
Unit II	Productivity evaluations in companies and organizations, productivity planning, short, intermediate, long terms.	9 lectures
Unit III	Productivity improvement concepts, technology, material based, employee based techniques.	10 lectures
Unit IV	Productivity improvement concepts, product and task- based, total productivity models, National Productivity Council and its role.	10 lectures
Unit V	Work centers, machine productivity, TIP and WIP role of engineers and supervisors in productivity improvement.	10 lectures
Unit VI	Productivity in automated factories, CAD, CAM, CIM systems, robotics.	8 lectures

Recommended Books:

1. Productivity Management: A Systems Approach, Prem Vrat, McGraw, 1998.
2. Productivity Engineering and Management- David J. Sumanth, McGraw, 1984.
3. Comprehensive Production and Operation Management- K.C. Arora, Laxmi Publications Pvt. Ltd., 2004.
4. Total Quality Management, D.H.Besterfield,Pearson, 2011.

ME 4004:	Statistical Quality Control: 4 Credits (4-0-0)	
Unit I	Introduction to quality control, fundamentals of statistical concepts and techniques in quality control and improvement, graphical methods and data representation.	9 lectures
Unit II	Statistical process control using control charts, control charts for variables and attributes, process capability analysis.	9 lectures
Unit III	Acceptance sampling plans for attributes and variables, operating characteristic curves, A & L system for Lot by Lot acceptance sampling, sampling plans, MILSTD411, Dodge -Romig sampling plans, LTPD, AOQL.	10 lectures
Unit IV	Chain sampling, Continuous sampling, skip lot, economic design of sampling plans.	9 lectures
Unit V	Life testing, life cycle curve and probability distributions in modeling reliability, system reliability.	9 lectures
Unit VI	Experimental design and Taguchi Methods, factorial designs, signal to noise ratio, Taguchi definition of quality.	10 lectures

Recommended Books:

1. Statistical Quality Control - D.C. Montgomery, Wiley International, 2012.
2. Statistical Quality Control- G. L.Worth, McGraw Hill Education Pvt. Ltd., 1996.
3. Quality Planning and Analysis - J.Juran, McGraw Hill Education Pvt. Ltd., 1993.
4. Managing Quality, Concepts and Tasks, N.S.Sreenivasan, New Age Publishers, 1st Ed., 2005.

ME 4005	Control Systems: 4 Credits (4-0-0)	
Unit I	Feedback system, mathematical modelling of physical systems, laplace transformation, block diagrams, signal flow graphs, state-space models.	10 lectures
Unit II	Time domain analysis: Performance specifications, steady state error, transient response of first and second systems, stability analysis, Routh-Hurwitz stability criterion, relative stability.	12 lectures
Unit III	Control action: On/Off, Proportional(P), Integral(I), Differential(D) control actions, PI, PD and PID controllers, Lead, Lag and Lag-lead compensators, root-locus method: Analysis, design.	11 lectures
Unit IV	Frequency response method: Bode diagrams, Nyquist stability criterion, Performance specifications, design, state-space methods, analysis, design	12 lectures
Unit V	Physical realizations of controllers: Hydraulic, pneumatic and electronic controllers.	11 lectures

Recommended Books:

1. Modern Control Engineering, K. Ogata, Pearson Education Asia, 4th Ed., 2002.
2. Automatic Control Systems, B. C.Kuo and F. Golnaraghi, John Wiley, 8th Ed., 2002.
3. Control Systems: Principle and Design, M. Gopal, Tata McGraw Hill, 2nd Ed., 2002.
4. Modern Control System Theory, M. Gopal, New Age International, 2nd Ed., 1993.
5. Modern Control Systems, R. C. Dorf and R. H. Bishop, Addison Wesley, 8th Ed.,1998.

ME 4006	: Solar Energy Engineering: 3 Credits (3-0-0)	
Unit I	Introduction to solar energy, solar radiation analysis, characteristics of sun, earth and solar constant, potential evaluation, solar radiation measurement and estimation.	6 lectures
Unit II	Flat plate collectors, principles of energy conversion, general energy balance equation and collector efficiency, construction, design, selective surfaces, concentrating collectors, types, modes of tracking, performance of CPC collector, solar air heaters, applications.	10 lectures
Unit III	Thermal energy storage, mediums, non-convective solar pond, solar cells	6 lectures

Unit IV	Solar heating, passive systems, solar air conditioning, power generation, introduction of solar photovoltaic systems.	6 lectures
Unit V	Agricultural and industrial processes; Heating, distillation, pumping, furnace, cooling, green houses, production of hydrogen.	6 lectures
Unit VI	Indirect sources of solar energy conversions, wind energy, biomass, OTEC.	8 lectures

Recommended Books :

1. Solar Energy, S.P. Sukhatme, Tata McGraw-Hill, 1996.
2. Solar Energy: Fundamentals and Applications, H.P. Garg and J. Prakash, Tata McGraw-Hill, 1997.
3. Solar Power Engineering, B.S. Magal, Tata McGraw-Hill, 1993.
4. Solar Engineering of Thermal Processes, I.A. Duffie and W.A. Beckman, Wiley International, 1991.
5. Non-Conventional Energy Resources, B.H. Khan, Tata McGraw-Hill, 2nd Ed., 2009.

Syllabi of courses offered to other departments only

ME 4121 Principles of Mechanical Engineering: 4 Credits (3-1-0) [For CE students]		
Unit I	Introduction to engineering thermodynamics: Thermodynamic systems & surroundings, thermodynamic properties, states, processes and cycles, heat and work transfer, path function and point function, thermodynamic equilibrium, quasi-static processes, flow & non flow processes, thermodynamic laws & their applications.	6 Lectures
Unit II	Introductory heat transfer: Conduction, convection & radiation, heat flow through building materials, simple power generating equipments like boiler, turbines and IC engines.	7 Lectures
Unit III	Power transmission devices. Belt drives, chain & rope drives, gear drives, conveyors and hoists.	7 Lectures
Unit IV	Engineering materials (cast iron, steel and their alloys) properties, various heat treatment and manufacturing processes, fibres and composites, applications of composite materials.	8 Lectures
Unit V	Introduction to the machine tools: Introduction to working principles of working, construction of lathe, drilling, shaping and milling machines, types of cutting tools, selection of cutting speeds, feeds.	7 Lectures
Unit VI	Introduction to theory of machines : Kinematics and kinetics, mechanism and structures, various mechanisms of practical use, fundamentals of kinematics, degree of freedom and its determination, lower pairs and higher pairs, types of motions, links, joints and kinematic chains, inversions, graphical velocity & acceleration analysis.	7 Lectures

Recommended Books:

1. Engineering Thermodynamics, P.K.Nag, TMGH, 2005.
2. Thermal Engineering, P.L. Ballaney, Khanna Publishers, 3rd Ed., 2009.
3. Elements of Workshop Technology (Vol I & II), S.K.H. Choudhary, A.K.H.Choudhary and N. Roy, Media Promoters & Publishers Pvt. Ltd., 2007.
4. Theory of machines, S.S. Rattan., Tata Mc Graw Hill, New Delhi,1991
5. Material and Metallurgy, H.S.Bawa, TMGH,1986.

Deaprtment of Chemistry
Programme: Diploma Module

CY 3101   Chemistry III : Credits 4 (3-0-2)

Unit I	**First Law of Thermodynamics**: Scope, importance and limitations of thermodynamics, Terminology of thermodynamics, Work and heat, Internal energy, First law of thermodynamics, Isothermal and adiabatic processes, Work done in reversible and irreversible processes involving ideal gases, Enthalpy, Heat capacities, C_p-C_v relationship for ideal gases, Joule-Thomson coefficient for ideal and real gases.	7 lectures
Unit II	**Thermochemistry**: Endothermic and exothermic reactions, Heat of reaction at constant volume and at constant pressure, Enthalpy of reactions, Enthalpy of combustion, Enthalpy of formation, Standard enthalpy of formation and relative enthalpies of compounds, Enthalpy of solution and dilution, Enthalpy of neutralization, Enthalpy of precipitation, Hess's law and its applications, Bond energy, its calculation and applications.	6 lectures
Unit III	**Second Law of thermodynamics**: Second law of thermodynamics, spontaneous and non-spontaneous processes, Entropy and its physical significance, Gibb's free energy and its physical significance, Criteria of spontaneity, Gibbs-Helmholtz equation, Clapeyron-Clausius equation and its applications.	6 lectures
Unit IV	**Chemical Kinetics**: Rate of reaction, Factors influencing rate of reaction, Molecularity and order of reaction, Rate expression and examples of first and second order reactions, Determination of order of reactions, Effects of temperature on rate of reaction, Threshold energy, Activation energy and Arrhenius equation.	7 lectures
Unit V	**Solutions**: Types of solutions, concentration of solution, vapour pressure, Solutions of solid in liquid, Liquid in liquid and gas in liquid, Solubility and solubility curve, Raoult's law, Ideal and non-ideal solutions, Henry'a law. **Colligative Properties of Dilute Solutions**: Colligative properties of dilute solution of non-electrolytes, Relative lowering of vapour pressure, Elevation in boiling point, Depression in freezing point, Osmotic pressure, Abnormal colligative property and Van't-Hoff factor.	8 lectures
Unit VI	**Surface Chemistry and Catalysis:** Adsorption: Adsorption of gases, Factors influencing adsorption, Heat of adsorption, Physical and chemical adsorption, Freundlich adsorption isotherm, Isobar and isochore, Adsorption from solution, Application of adsorption. **Catalysis**: Catalysts, Catalysis, Autocatalysis, Negative catalysis and poisons, General characteristics, Homogeneous and heterogeneous catalysis.	8 lectures

Recommended Books:

1. Pradeep's New Course Chemistry (Class XI and XII), S. C. Kheterpal, P. N. Kapil, S. N. Dhawan and R. S. Nandwani, 2012, Pradeep Publication, Jalandhar.

2. Modern's abc Chemistry (Class-XII), S. P. Jauhar and S. K. Malhotra, 2014, Modem Publishers, New Delhi.

3. Principles of Physical Chemistry, B. R. Puri, L. R. Sharma & M. S. Pathania, 2013, Vishal Publishing Co., Jalandhar.

4. Physical Chemistry, P. C. Rakshit, 7th Edn., 2004, Sarat Book House, Kolkata.

5. Physical Chemistry, P. W. Atkins, 10th Edn., 2014, Oxford University Press, ELBS Edn., London.

CY 3201   Engineering Chemistry- I :   Credits 4 (3-0-2)

Unit 1	**Metals and Alloys:** Important ores of copper and aluminium, their extraction and uses. Chemistry of Silicon, Germanium and Phosphorous with reference to their compounds and reactions. Definition, classification and significance of alloys. Composition and uses of Brasses, Bronzes, Nichrome, Duralumin, Solders, Alnico and Stainless steel.	10 lectures
Unit II	**Corrosion and its prevention:** Definition; Theories of corrosion (Dry and wet) and their mechanism. Factors affecting the rate of corrosion. Prevention of corrosion.	5 lectures
Unit III	**Polymers and polymerization:** Definition; classification of polymers; functionality. Types of polymerization (addition and condensation). Preparation, properties and uses of addition polymers like PE, PP, PVC, PS, PVA, PMMA, PTFE, PAN and condensation polymers like polyamides, polyesters, phenoplasts, aminoplasts. Mechanisms of different types of addition polymerization. Natural and synthetic rubbers; vulcanization and its importance.	12 lectures
Unit IV	**Water treatment:** Boiler Feed water-Hardness, its units and determination; scale and sludge formation, boiler corrosion, caustic embrittlement; priming, foaming and their prevention. Conditioning, internal treatment using carbonate, phosphate and calgon conditioning; and external treatment using soda-lime, zeolite and ion-exchange process. Municipal water, water treatment (purification, coagulation, filtration and disinfection) for municipal supply.	9 lectures
Unit V	**Engineering materials:** Cement: Cement and its classification; Portland cement-manufacture, chemical composition, setting and hardening, IST specifications, physical properties and decay. Glass: Manufacture of glass; types of glasses and their uses. Liquid crystals; Introduction, classification, chemical constitution, liquid crystalline behaviour in homologous series, molecular ordering in different mesophases, applications.	6 lectures

Recommended Books:

1.   A text book of Engineering Chemistry, Shashi Cawla, 3rd Edn., 2003, Dhanpat Rai and Co. Pvt. Ltd. Delhi.

2.   A text book of Engineering Chemistry, S.S. Dara, 2013, S. Chand & Company Ltd, New Delhi.

3.   Engineering Chemistry, B. Sivashankar, 2008, Tata McGraw-Hill Publishing company Limited, New Delhi.

4.   Engineering Chemistry, P.C. Jain and Monica Jain, 16th Edn., 2014, Dhanpat Rai and Co. Pvt. Ltd., Delhi.

5.   Polymer Science, 1st Edn., 1986, V. R. Gowarikar, N. V. Wishwanathan & J. Sreedhar, Wiley-Eastern Ltd; New Delhi.

CY 3202   Engineering Chemistry- IA: Credits 4 (3-0-2)

Unit-I	**Metals and Alloys :** Important ores of Iron. Manufacture of pig iron, cast iron and its varieties. Wrought iron and its manufacture. Alloys and their significance. Steel and its manufacture by Bessemer, open hearth and L-D processes. Composition, properties and uses of stainless steel, Invar, Alnico, Tungsten steel, Silicon steel, Brass, Bronze, Gun metal, Duralumin, Magnelium, Soft solders.	9 lectures
Unit-II	**Corrosion and its prevention :** Definition, theories of corrosion (Dry and Wet) and their mechanism. Factors affecting the rate of corrosion. Prevention of corrosion.	5 lectures
Unit-III	**Polymers :** Definition, classification of polymers, functionality. Polymer structure and their strength. Types of polymerization (Addition and Condensation). Thermoplastic and Thermosetting resins. Preparation, properties and uses of Polyethylene, Polypropylene, PVC, Polyamide and Polyesters. Phenoplasts and Aminoplasts resins. Natural and some synthetic rubbers. Vulcanization.	10 lectures
Unit-IV	**Fuel and Combustion :** Classification of fuels, ignition temperature, calorific value and its determination, characteristic of a good fuel. Solid fuels: Wood (average composition and calorific values); transformation of wood to coal, average composition and calorific value of peat, lignite, bituminous and anthracite coal, carbonization of coal. Liquid fuels: Petroleum and its fractional distillation, boiling ranges, approximate composition and uses of different fractions; Cracking, octane and cetane numbers, unleaded petrol, improvement of octane/cetane number by using organometallics, aromatics and oxygenates. Gaseous fuels: Preparation, composition, properties and uses of producer gas, water gas, oil gas and biogas, average composition and uses of natural gas, LPG and CNG.	8 lectures
Unit-V	**Water Treatment :** Boiler feed water-hardness, its units and determination; scale and sludge formation, boiler corrosion, caustic embrittlement, priming. foaming and their prevention. Conditioning (internal and external): phosphate, carbonate and calgon conditioning; sodalime, zeolite and ion exchange processes. Municipal water, water treatment (purification, coagulation, filtration and disinfection) for municipal supply.	10 lectures

Recommended Books:

1. A text book of Engineering Chemistry, Shashi Cawla, 3rd Edn., 2003, Dhanpat Rai and Co. Pvt. Ltd. Delhi.
2. A text book of Engineering Chemistry, S.S. Dara, 2013, S. Chand & Company Ltd, New Delhi.
3. Engineering Chemistry, B. Sivashankar, 2008, Tata McGraw-Hill Publishing company Limited, New Delhi.
4. Engineering Chemistry, P.C. Jain and Monica Jain, 16th Edn., 2014, Dhanpat Rai and Co. Pvt. Ltd., Delhi.
5. Polymer Science, 1st Edn., 1986, V. R. Gowarikar, N. V. Wishwanathan & J. Sreedhar, Wiley-Eastern Ltd; New Delhi.

Deaprtment of Mathematics
Programme: Diploma Module

MA-3101 ENGINEERING MATHEMATICS-I : 4 Credits   (3-1-0)

Unit I	Functions of two or more variables, partial differentiation, homogeneous functions, Euler's theorem for homogeneous functions, change of variables, maxima and minima for function of two variables, Lagrange's method of undetermined multipliers.	8 Lectures
Unit II	Improper integrals, Beta and Gamma functions, relation between Beta and Gamma functions, double and triple integrals, change of order of integration.	8 Lectures
Unit III	Scalar and vector field, differentiation and integration of vector point function, directional derivative, gradient, divergence and curl, line, surface and volume integrals; Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (statements only and simple problems).	12 Lectures
Unit IV	Elementary transformations of matrices, rank of a matrix, consistency and inconsistency of linear simultaneous equations, characteristic values and characteristic vectors of a matrix, Caley-Hamilton theorem and its application to find the inverse of a matrix.	8 Lectures
Unit V	Introduction to infinite series, convergence and divergence of an infinite series, p-test, comparison test, root test and ratio test.	6 Lectures

Recommended Books:
1. A Text Book of Engineering Mathematics, N.P. Bali and M. Goyal, Laxmi Publications.
2. Schaum's Outline of Vector Analysis, M.R. Spiegel, , Schaum's Outline Series.
3. Engineering Mathematics, K.A. Stroud, Industrial Press Inc., 7th Edition, 2013.

References:
1. Calculus and Analytic Geometry, G.B. Thomas and R.L. Finey, Addison Wesley, 9th edition, 1996.
2. Linear Algebra, G. Hadley, Narosa, Reprint 2002.

MA-3102 Comprehensive Mathematics-IA : 4 Credits   (3-1-0)

Unit I	Introduction of complex numbers, sum, difference, multiplication and division of complex numbers, properties of complex numbers, square root of complex number, cube root of unity, polar form of a complex number, De-Moivre's theorem, arithmetic progression: general term and sum of n terms of an AP, arithmetic mean of two numbers, geometric progression: general term and sum of n terms and infinite terms of an geometric progression, geometric mean.	10 Lectures
Unit II	Introduction to permutations and combinations, problems on permutations and combinations. binomial theorem for positive integral index, middle terms, general terms, binomial theorem for any index.	6 Lectures

Unit III	The trigonometrical ratio of multiple and submultiple angles, trigonometrical ratios of angel 180^0 , 360^0, etc., trigonometrical identities and equations, relations between the sides and the trigonometrical ratios of the angles of any triangles, simple problem of heights and distances.	8 Lectures
Unit IV	Cartesian system of rectangular coordinates, distance between two given points, area of a triangle, condition for collinearity for three points, section formulae, centroid of a triangle, slope of line, equation of straight line in different form: intercept form, slope form, general form, angle bisector between two lines, condition of parallelism and perpendicularity of lines, equation of line parallel to given line and perpendicular to given line, point of intersection of two lines.	10 Lectures
Unit V	General equation of a circle, tangent and normal to a circle, introduction to conic section: parabola, ellipse, hyperbola.	8 Lectures

Recommended Books:
1. Trigonometry, S.L. Loney, Arihant Publication.
2. Coordinates Geometry, S.L. Loney, Arihant Publication.
3. Mathematics for Class-XI, R.D Sharma, Dhanpati Rai, New Delhi

References:
1. Complex Variables and Applications, Churchill & Brown, McGraw-Hill Higher Education; 8 edition.
2. Complex Variables: theory & Applications, H.S. Kasana:: Prentice Hall of India private Ltd.

MA-3201   ENGINEERING MATHEMATICS-II (AE, CS, EE, CE, ME) : 4 Credits (3-1-0)

Unit I	Linear ordinary differential equations of order two with constant and variable coefficients, complementary function and particular integrals, method of variation of parameters, differential equations of first order but not of first degree: solvable for p, solvable for x, solvable for y and Clairaut's form.	12 Lectures
Unit II	Introduction to partial differential equations, Lagrange's method for solving linear partial differential equations, Charpit's method for solving nonlinear partial differential equations.	8 Lectures
Unit III	Laplace transform, linear property of Laplace transform, shifting theorems, change of scale property, Laplace transform of the derivatives, Laplace transform of integrals, multiplication by t, division by t.	6 Lectures
Unit IV	Inverse Laplace transform, inverse Laplace transform of derivatives, inverse Laplace transform of integrals, multiplication by powers of t, division by powers of t. convolution theorem, application of Laplace transform to find the solutions of ordinary differential equations with constant and variable coefficients.	6 Lectures
Unit V	Random variables, discrete and continuous random variables, probability mass function and probability density function, probability distribution, Bernoulli's, Binomial, Poisson and Normal distributions.	10 Lectures

Recommended   Books:
1. A Text Book of Engineering Mathematics, N.P. Bali and M. Goyal, Laxmi Publications.
2. Schaum's Outline of Laplace Transforms, M.R. Spiegel, Schaum's Outline Series, McGraw-Hill, 1965.
3. Ordinary and Partial Differential Equations, M.D. Raisinghania, 8th Edition, S. Chand Publication, 2005.
4. Fundamental of applied statistic, S. C. Gupta & V. K. Kapoor, S Chand and Sons.
References:
1. Ordinary Differential Equations, M. Tenenbaum and H. Pollard, Dover Publications, 1985.
2. Differential Equations with Applications and Historical Notes, G.F. Simmons, 2nd Edition, McGraw Hill, 2012.

MA-3202 ENGINEERING MATHEMATICS-II (EC) : 4 Credits (3-1-0)

Unit I	Linear ordinary differential equation of order two with constant coefficients and variable coefficients, complementary function and particular integrals, method of variation of parameters, differential equations of first order but not of first degree: solvable for p, solvable for x, solvable for y and Clairaut's form	10 Lectures
Unit II	Introduction to partial differential equations, Lagrange's method for solving linear partial differential equations, Charpit's method for solving nonlinear partial differential equations	7 Lectures
Unit III	Fourier series, even and odd functions, half-range Fourier series, Fourier series for functions having arbitrary period, Fourier integral	6 Lectures
Unit IV	Fourier transform and its applications to solve partial differential equations, Z transform and inverse Z transform.	9 Lectures
Unit V	Random variables, discrete and continuous random variables, probability mass function and probability density function, probability distribution, Bernoulli's, Binomial, Poisson and Normal distributions	10 Lectures

Recommended   Books:
1. A Text Book of Engineering Mathematics, N.P. Bali and M. Goyal, Laxmi Publications.
2. Schaum's Outline of Laplace Transforms, M.R. Spiegel, Schaum's Outline Series, McGraw-Hill, 1965.
3. Ordinary and Partial Differential Equations, M.D. Raisinghania, 8th Edition, S. Chand Publication, 2005.
4. Fundamental of applied statistic, S. C. Gupta & V. K. Kapoor, S Chand and Sons.
References:
1. Ordinary Differential Equations, M. Tenenbaum and H. Pollard, Dover Publications, 1985.
2. Differential Equations with Applications and Historical Notes, G.F. Simmons, 2nd Edition, McGraw Hill, 2012

MA-3203 COMPREHENSIVE MATHEMATICS -IIA : 4Credits   (3-1-0)

Unit I	Differential calculus, concept of a function, graph of some elementary functions, limit, continuity and differentiability of functions, derivative of elementary functions, derivatives of sum, product and quotient of functions, differentiation of exponential, logarithmic, trigonometrical, inverse trigonometrical, hyperbolic functions and parametric functions.	12 Lectures

Unit II	Integration of elementary functions, integral of sum of two or more functions, integration by substitution, integration by parts, integration of rational and irrational algebraic functions, definite integrals.	10 Lectures
Unit III	Introduction to differential equations, formation of differential equations, order and degree of a differential equations, differential equations of first order and first degree (linear, homogeneous, exact differential equations), linear differential equations of second order with constant coefficients.	8 Lectures
Unit IV	Finite difference, introduction to interpolation, interpolation with equal intervals, Newton's Gregory forward and backward difference formulae for equal intervals.	6 Lectures
Unit V	Gauss central difference interpolation, numerical integration by trapezoidal, Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rules, numerical solution of first order and first degree differential equations by Runge-Kutta method of 4th order	6 Lectures

Recommended Books:
1. A text book of numerical methods, P. Khandasami**.:**
2. Mathematics for Class-XII, R.D Sharma, Dhanpati Rai, New Delhi.
3. Higher Engineering Mathematics, N. P. Bali**,** Laxmi publication, New Delhi, 2007
4. Calculus, Thomas and Finney, Pearson

 References:
1. Differential Equations, S. L. Ross**,** Wiley Student Edition.
2. Fundamental of numerical methods, Kincaid and Chiney

Deaprtment of Physics
Programme: Diploma Module

PH 3101 Physics III A :   Credits 5   (4-0-2)

Unit I	Reversible, irreversible processes, Carnot engine, efficiency of Carnot engine, concept of entropy, entropy and second law, black body radiation, Kirchhoff's law, Stefan's law, energy distribution, Planck's law of radiation, electromagnetic spectrum	**10 Lectures**
Unit II	Flux of electric field, Gauss' Law and its applications for symmetric charge distributions, electric potential of continuous charge distributions, calculating field from potential, capacitance, energy stored in an electric field, dielectrics and Gauss's law, current density and drift speed, Ohm's law-microscopic view, Hall effect, Biot-Savart law and its application to straight current carrying conductor and circular current loop, Ampere's circuital law and its applications to solenoid and toroid, energy stored in magnetic field.	**16 Lectures**
Unit III	Wave front, Huygens' principle, reflection and refraction of waves using Huygen's principle, coherent sources, interference of light waves and Young's double-slit experiment, intensity in double-slit interference, thin film interference, Newton's rings, single-slit, diffraction grating, polarization, law of Malus, polarization by reflection.	**16 Lectures**
Unit IV	Nuclear materials and their properties, availability in India, nuclear force, radioactivity and decay laws, nuclear fission, nuclear fusion, and nuclear reactor, Nuclear power generation systems, effect of nuclear wastes, nuclear radiation shielding methods.	**8 Lectues**
Unit V	Crystal structure of solids, space lattice, unit cell & Bravais lattice, coordination number, atomic packing factors, crystal directions and planes, Miller indices, defects in crystals.	**6 Lectures**

Recommended Books :
1. Concepts of Physics, H.C. Verma, Bharti Bhawan.
2. Physics for Engineers, Neeraj Mehta, Prentice Hall of India.
3. Physics, R. Resnick, D. Halliday & K. S. Krane, John Wiley & Sons.
4. Materials Science & Engineering, V. Raghavan, Prentice Hall of India.

PH 3102 Physics III B (for AE, CE, CS, ME) : Credits 3 (2-0-2)

Unit I	Flux of electric field, Gauss' law and its applications to symmetric charge distribution, electric potential of continuous charge distributions, calculation of field from potential, capacitance, energy stored in an electric field, dielectrics and Gauss's law, current density and drift speed, Ohm's law-microscopic view, Hall effect, Biot-Savart law and its application to straight current carrying conductor and circular current loop, Ampere's circuital law and its applications to solenoid and toroid.	**12 Lectures**
Unit II	Wavefront, Huygens' principle, refraction and reflection of waves using Huygens' principle, coherent sources, interference of light waves and Young's double-slit experiment, intensity in double- slit interference, thin film interference, Newton's rings, single-slit diffraction, grating, polarization, law of Malus, polarization by reflection.	**10 Lectures**
Unit III	Nuclear materials and their properties, availability in India, nuclear force, radioactivity and decay laws, nuclear fission, nuclear fusion, and nuclear reactor, Nuclear power generation systems, effect of nuclear wastes, nuclear radiation shielding methods of radiation.	**6 Lectures**

Recommended Books :
1. Concepts of Physics, H.C. Verma, Bharti Bhawan.
2. Physics, R. Resnick, D. Halliday & K. S. Krane, John Wiley & Sons.
3. University Physics, F.M. Sears, M.W. Zemansky & H.D.Young, Narosa Publishing House, New Delhi.
4. Modern's ABC, Vol. II, S.K Gupta, Modern Publishers, New Delhi.

PH 3103 Atmospheric Physics and Climate Change : Credits3 (3-0-0)

Unit I	Planetary climates, Earth's climate system: atmosphere, lithosphere, hydrosphere, cryosphere, biosphere and anthrosphere. Climate as a result of interactions of spheres.	6 Lectures
Unit II	Kirchhoff's law, Stefan's law, Wien's law, Planck's law, thermodynamic laws and applications, spectral and thermal analysis of atmosphere, relation between temperature and pressure, isobars and isotherms.	6 Lectures
Unit III	Global energy balance, measuring greenhouse effect, radiative-convective model, the North-South asymmetry in energy distribution and global warming impacts.Natural and anthropogenic indicators of climate change, atmospheric aerosols, aerosol forcing (primary and secondary), white-house effect, anthropogenic and natural forcing.	10 Lectures
Unit IV	Rotating-orbiting earth, Coriolis force, differential heating and pressure gradient force, frictional force, cyclones, geostrophic wind, jet streams, cells, wind belts, general circulation model, El Nino and its effect on jet stream, planetary heat transport, thermohaline circulation, Walker circulation, thermocline; water cycle, carbon cycle, ice-albedo feedback.	10 Lectures
Unit V	Observation versus simulations, characteristic time scales, development of models, climate models, grid model, sub-grid scale phenomena, climate scenarios, magnitude of response to CO2 concentration, changing climate statistics, effect of extreme temperatures, prediction uncertainties, instruments for climate control.	10 Lectures

Recommended Books:
1. Physics of the Atmosphere and Climate, M.L. Salby, 2nd Edition, Cambridge University Press.
2. An Introduction to Atmospheric Physics, David G. Andrews, 2nd Edition, Cambridge Universty Press.
3. An Introduction to Atmospheric Thermodynamics, A. A. Tsonis, 2nd Edition, Cambridge University Press.
4. Elementary Climate Physics, F.W. Taylor, 1st Edition, Oxford University Press.

PH 3201 Physics-IV A (for CSE) : Credits 3 (2-0-2)

Unit I	R-C.R-L, LC (em-oscillations) and LCR circuits, AC circuits: mean and rms values of current & power in AC circuits, resistance, inductance and capacitance circuits & their combinations, series and parallel RLC circuits, resonance.	6 Lectures
Unit II	Maxwell's equations (integral and differential form) and their physical significance, speed of em-waves, displacement current, em-wave equations, em-wave in free space and perfect dielectrics, phase factor ad wavelength, wave propagation in conducting media and in good dielectrics, skin effect. Intrinsic impedance of a dielectric and conducting media, Poynting vector, boundary condition (dielectric-dielectric, conductor-dielectric and conductor free space).	10 Lectures
Unit III	Para, dia and ferromagnetism, different types of magnetic materials, ferroelectrics, ferrites and their applications, superconductivity.	4 Lectures
Unit IV	Band theory of solids, conductors, insulators and semiconductors. elemental and compound semiconductors. Optical properties: absorption spectrum, photoconductivity, photovoltaic effect, luminescence. Junction properties: metal-metal junction, metal-semiconductor junction, p-n junction.	8 Lectures

Recommended Books :
1. University Physics, F. M. Sears, M. W. Zemansky & H. D. Young, Narosa Publishing House, New Delhi.
2. Materials Science & Engineering, V. Raghavan, Prentice Hall of India
3. Elements of Electromagnetic (3rd edition), Mathew, N.O. Sadiku, Oxford University Press.
4. Electronic Devices and Circuits, J. Millman and C.C. Halkias, McGraw Hill Book Co. Ltd.

PH 3202 Physics-IV B (for CE, ME and AE) : Ctredits 3   (2-0-2)

Unit I	Magnetic properties of materials, Para, dia and ferromagnetism, anti-ferrimagnetism, effect of temperature on magnetic properties, magnetic hysteresis, soft and hard magnetic materials, superconductivity.Energy band model for conductors, insulators and semiconductors, effect of temperature on intrinsic semiconductivity, extrinsic semiconductors, p-n junction.	**12 Lectures**
Unit II	Crystal structure of solids, Space lattice, unit cell & Bravais lattice, coordination number, atomic packing factors, crystal directions and planes, Miller indices, defects in crystals.	**8 Lectures**
Unit III	X-ray diffraction, Bragg's law, Bragg's X-ray spectrometer, electron diffraction, fundamental of quantum mechanics and applications in engineering. Ultrasonic waves-production, application in ranging, cleaning, drilling & materials testing.	**8** Lectures

Recommended Books :
1. University Physics, F.M. Sears, M.W. Zemansky & H. D. Young, Narosa Publishing House, New Delhi.
2. Materials Science & Engineering, V. Raghavan, Prentice Hall of India.
3. Foundations of Material Science & Engineering, W. F. Smith, McGraw Hill Inc.
4. Physics, R. Resnick, D. Halliday, John Wiley & Sons.

Deaprtment : Humanities and Social Science
Programme: Diploma Module

HS 3101 Communication skill : 3 Crdits (2-0-2)

UNIT -I	Comprehension of unseen passages	5 Lectures
UNIT -II	Essay-I Reading/Explanation & Essay-II: Reading/Explanation One Novel for non-detailed study	8 Lectures
UNIT -III	Idioms and Figures of Speech; rhetoric and Poetry. Poem- I : Reading/Explanation & Poem-II : Reading/Explanation	5 Lectures
UNIT -IV	Introduction to Narratives and Prose.	5 Lectures
UNIT -V	Analysis: Speech – I, Writing Skills, Oral Skills.	5 Lectures

Recommended books:
1. Modern Linguistics: an Introduction - Verma and Krishanswamy, Oxford University Press
2. Modern Prose: Stories, Essays and Sketches - Michael Thorpe, Oxford University Press
3. Writing Skills - Oliviera and Motta, Penguin.4. Oxford Guide to Effective Writing & Speaking - John Seely, Oxford Press.

HS 4101 Principles of Economics: 3 Credits   (3-0-0)

Unit-I	Definition, of economics, Scope of economics, Micro vs. Macroeconomics, Basic Problems of Economy, Consumers' Behaviour, Utility Analysis.	8 Lectures
Unit-II	Indifference curve theory, supply and demand theory, General equilibrium, elasticity of demand, Elasticity of demand	9 Lectures
Unit-III	Theory of production, Cost of production, supply functions, Revenue functions, Producers' equilibrium.	10 Lectures
Unit-IV	Price and output determination under different market situations.	8 Lectures
Unit-V	National Income, Exchange rate, Inflation & Deflation. Business Cycle .	7 Lectures

Recommended Books:
1. Microeconomic Analysis – R. R. Barthwal, Wiley Eastern Ltd. N.D.1991.
2. Principles of Microeconomics - D.D. Tewari & K. Singh, New Age   International, New Delhi, 1996.
3. Microeconomics - Kourtsoyanis, ELBS, McMillan, London, 1985.
4. Principles of Economics - M L Seth and L N Agrawal, Educational Publication,Agra, 1995.
5. Economics – P. A. Samuelson & W. D. Nordhaus, Tata McGraw Hill   Publications, New Delhi, 2002.
6. Principles of Economics – K. E. Case & R. C. Fair, Pearson Education, 2007.

HS 4201 Principles of Economics and Costing: 4 Credits   (4-0-0)

Unit-I	Definition of Economics, Scope and relation of Economics with other subjects, Economic systems, Micro vs Macro Economics: Laws of Supply and Demand; General market equilibrium, Elasticity of demand.	11 Lectures
Unit-II	Consumer Behavior, Consumers' equilibrium through Utility analysis and Indifference curve analysis. Price, income and substitution effects.	12 Lectures
Unit-III	Production Theory, Cost of Production and Supply Theory, Different types of costs and costing.	10 Lectures
Unit-IV	Producer's equilibrium, Price & output determination in perfect competition, Monopoly market, Monopolistic market, Oligopoly market and Price Discrimination.	11 Lectures

Unit-V	Capital budgeting & its importance; Identification of investment opportunities; Feasibility report presentation; Project evaluation; Break even analysis; Social cost-benefit analysis, Time value of money; Present worth; Balance sheet; Profit & loss account; Preparation of cash flow statements. Business cycle, Depreciation and Appreciation of currency, Inflation and Exchange rate.	12 Lectures

Recommended Books:

1. Microeconomic Analysis – R. R. Barthwal, Wiley Eastern Ltd. New Delhi, 1991.
2. Microeconomics - Kourtsoyanis, ELBS, McMillan, London, 1985.
3. Economics – P. A. Samuelson & W. D. Nordhaus, Tata McGraw Hill Publications, New Delhi, 2002.
4. A Text Book of Economic Theory – Alfred W. Stonier & Douglas C. Hague, Pearson Education, New Delhi, 2004.
5. Microeconomic Theory – James M. Henderson & Richard E. Quant, Tata McGraw Hill, New Delhi, 2006.
6. Cost Accounting & Financial Management – Ravi M. Kishore, Taxmann Allied Services, Pvt., New Delhi-5, Ltd. 2003.
7. Advanced Cost Accounting and Cost Systems - Ravi M. Kishore, Taxmann Allied Services, Pvt., New Delhi-5, Ltd. 2003.

HS 4203 Agricultural Economics and Farm Management : 3 Credits (3-0-0)

Unit-I	Definition, scope and importance of agricultural economics, Laws of demand and supply, market equilibrium, Elasticity of demand,	8 Lectures
Unit-II	Production theory, Factors of Farm Production, Producers equilibrium, costs of production, supply functions, Cost Depreciation; Cost of farm resources, and economic size of holdings, Farm efficiency and Production efficiency.	9 Lectures
Unit-III	Producers' equilibrium & Price and output determination of farm produce in different market situations; Definition, nature and characteristics of farm management. Farm management problems under Indian condition, Decision making process.	9 Lectures
Unit-IV	Financial analysis; Break-even analysis, Benefit-Cost Ratio, NPV, Internal Rate of Return, Payback period analysis.	8 Lectures
Unit-V	Capital budgeting for Farms, Sources of Finance, Management of land, labour, capital and farm machinery, irrigation systems. Crop yield index and cropping intensity.	8 Lectures

Recommended Books:

1. Fundamentals of Farm Business Management - S. S. Johl & R. R. Kapur, Kalyani Publishers, Ludhiana, 1997.
2. Agriculture Business Management - W. David Downey & S.P. Erickson, Tala McGraw Hill, New Delhi, 1996.
3. Farm Management, Planning, Control and Implementation - Ronald D. Kay, Tala McGraw Hill, New Delhi, 1996.
4. Farm Planning & Control - C. S. Barnard, Cambridge University Press, Cambridge, 1988.