DISTRIBUTION OF COURSES FOR
B. Tech. (Agricultural Engineering)

FIRST YEAR

1st Semester

S. N.	Course Code	Course Name	Credits		
			Total	Th.	Pr.
1.	EMA 111	Engineering Mathematics-I	3	3	0
2.	EPH 111	Engineering Physics	3	2	1
3.	ECHE 111	Engineering Chemistry	3	2	1
4.	EME 111	Workshop Practice	1	0	1
5.	ECE 111	Surveying and Leveling	3	1	2
6.	ECE 112	Engineering Drawing	2	0	2
7.	EES 111	Environmental Science	3	3	0
8.	EEL 111	Electrical Circuits	3	2	1
		Total	**21**	**13**	**8**

2nd Semester

1	EMA 121	Engineering Mathematics-II	3	3	0
2	EEL 121	Computers Programming and Data Structures	3	1	2
3	EEL 122	Applied Electronics and Instrumentation	3	2	1
4	EAG 121	Agriculture for Engineers	4	3	1
5	EME 121	Workshop Technology	3	2	1
6	EME 122	Thermodynamics and Heat Engines	4	3	1
7	FMP 121	O & M of Tractor and Farm Machinery-I	1	0	1
8	ECE 121	Engineering Mechanics	3	2	1
		Total	**24**	**16**	**8**

1. ENGINEERING MATHEMATICS-I   EMA 111   3 (3 + 0)

Differential calculus: Taylor's and Maclaurin's expansions; indeterminate form; curvature, asymptotes, tracing of curves, function of two or more independent variables, partial differentiation, homogeneous functions and Euler's theorem, composite functions, total derivatives, derivative of an implicit function, change of variables, Jacobians, error evaluation, maxima and minima. Integral calculus: Reduction formulae; rectification of standard curves, volumes and surfaces of revolution of curves; double and triple integrals, change of order of integration, Gamma and Beta functions, application of double and triple integrals to find area and volume. Ordinary differential equations: Exact and Bernoulli's differential equations, equations reducible to exact form by integrating factors, equations of first order and higher degree, Clairaut's equation, Differential equations of higher orders, methods of finding complementary functions and particular integrals, method of variation of parameters, Cauchy's and Legendre's linear equations, simultaneous linear differential equations with constant coefficients, series solution techniques, Bessel's and Legendre's differential equations. Vector calculus: Differentiation of vectors, scalar and vector point functions, vector differential operator Del, Gradient of a scalar point function, Divergence and Curl of a vector point function and their physical interpretations, identities involving Del, second order differential operator; line, surface and volume integrals, Stoke's, divergence and Green's theorems (without proofs).

Reference:
1. Grewal, B.S. 1983. Higher Engineering Mathematics, Khanna Publishing House, New Delhi.
2. Love, C.E. and Rainville, E.D. 1968. Differential and Integral calculus. The Macmillon Co. New York,
3. Prasad, Gorakh, 1986. Textbook on Integral Calculus and elementary differential equations. Pothishala Pvt. Ltd., Allahabad.

2. ENGINEERING PHYSICS   EPH-111   3 (2+1)

Dia, Para and ferromagnetism-classification. Langevin theory of dia and paramagnetism. Adiabatic demagnetization, Weiss molecular field theory and ferromagnetism. Curie-Weiss law. Wave particle quality, de-Broglie concept, uncertainty principle. Wave function, Time dependent and time independent Schrodinger wave equation, Qualitative explanation of Zeeman effect, Stark effect and Paschan Back effect, Raman spectroscopy. Statement of Bloch's function, Bands in solids, velocity of Bloch's electron and effective mass. Distinction between metals, insulators and semiconductors, Intrinsic and extrinsic semiconductors, law of mass action, Determination of energy gap in semiconductors, Donors and acceptor levels. Superconductivity, critical magnetic field, Meissner effect, Isotope effect, Type-I and II superconductors, Josephson's effect DC and AC, Squids, Introduction to high T_c superconductors. Spontaneous and stimulated emission, Einstein A and B coefficients, Population inversion, He-Ne and Ruby lasers, Ammonia and Ruby masers, Holography-Note. Optical fiber, Physical structure, basic theory. Mode type, input output characteristics of optical fiber and applications. Illumination: laws of illumination, luminous flux, luminous intensity, candle power, brightness

Practical: To find the frequency of A.C. supply using an electrical vibrator; To find the low resistance using Carey Foster bridge without calibrating the bridge wire; To determine dielectric constant of material using De Sauty's bridge; To determine the value of specific charge (e/m) for electrons by helical method; To study the induced e.m.f. as a function of velocity of the magnet; To obtain hysteresis curve (B-H curve) on a C.R.O. and to determine related magnetic quantities; To study the variation of magnetic field with distance along the axis of a current carrying circular coil and to determine the radius of the coil; To determine the energy band gap in a semiconductor using a p-n Junction diode; To determine the slit width from Fraunhofer diffraction pattern using laser beam; Determination of ultrasonic wave velocity in a liquid medium; To find the numerical aperture of optical fiber; To set up the fiber optic analog and digital link; To study the phase relationships in L.R. circuit; To study LCR circuit; To study the variations of thermo e.m.f. of a copper-constantan thermocouple with temperature; To find the wave length of light by prism.

Reference:

1. Glasston, S. 1988. Source book of atomic energy. Affiliated East-West press, New Delhi.
2. Marion, J.B. and Hornyak, W.F. 1984. Principles of Physics: CBS College Publishing, New York.
3. Rajam, J.B. 1979. Atomic Physics. S. Choudhary Co. New Delhi.
4. Singhal, G.R. 1996. Modern Textbook of Physics. Universal book depot. Gwalior.

3. ENGINEERING CHEMISTRY   ECHE 111   3 (2+1)

Phase rule and its application to one and two component systems. Fuels: classification, calorific value. Colloids: classification, properties. Corrosion: causes, types and method of prevention. Water: temporary and permanent hardness, disadvantages of hard water, scale and sludge formation in boilers, boiler corrosion. Analytical methods like thermogravimetric, polarographic analysis, nuclear radiation , detectors and analytical applications of radio active materials. Enzymes and their use in the manufacturing of ethanol and acetic acid by fermentation methods. Principles of food chemistry, introduction to lipids, proteins, carbohydrates, vitamins, food preservators, colouring and flavouring reagents of food. Lubricants: properties, mechanism, classification and tests. Polymers. types of polymerization, properties, uses and methods for the determination of molecular weight of polymers. Introduction to IR spectroscopy.

Practical: Determination of temporary and permanent hardness of water by EDTA method; Estimation of chloride in water; Estimation of dissolved oxygen in water; Determination of BOD in water sample; Determination of COD in water sample; Estimation of available chlorine in bleaching powder; Determination of viscosity of oil; Estimation of activity of water sample; Estimation of alkalinity of water sample; Determination of carbonate and non-carbonate hardness by soda reagent; Determination of coagulation of water and chloride ion content; Determination of specific rotation of an optically active compound; Determination of λ_{max} and verification of Beer Lambert Law; Determination of calorific value of fuel; Identification of functional groups (alcohol aldelyde, keline, carbonylic acid and amide) by IR; Chromatographic analysis; Determination of molar refraction of organic compounds.

Reference:
1. Agarwal, C.V. 1969 or recent edition Chemistry of Engineering Materials. Tara Publication Varanasi.
2. Gyngell, E.S. 1989. Applied chemistry for Engineers B.I. Publications Bombay.
3. Richards, W.C. 1992. Engineering materials Science. Printice-Hall of India, New Delhi.
4. Jain, P.C. and Jain, M. 1998. Engineering Chemistry, Dhanpatrai Publication, Delhi.
5. Uppal, M.M., A Text Book of Engineering Chemistry, Khanna Publications, Delhi.

4. WORKSHOP PRACTICE   EME 111
1 (0+1)

Practical: Introduction to various carpentry tools, materials, types of wood and their characteristics and Processes OR operations in wood working; Preparation of simple joints: Cross half Lap joint and T-Halving joint; Preparation of Dovetail joint, Mortise and tenor joint; Introduction to Smithy tools and operations; Jobs on Bending, shaping etc.; Jobs on Drawing, Punching, Rivetting; Introduction to tools and measuring instruments for fitting; Jobs on sawing, filing and right angle fitting of MS Flat; Practical in more complex fitting job; Operations of drilling,, reaming, and threading with tap and dies; Practical test; Introduction to tools and operations in sheet metal work; Making different types of sheet metal joints using G.I. sheets.

Reference:

1. Arthur, D. *et. al*. 1998. General Engineering Workshop Practice. Asia Publishing House, Bombay.
2. Chapman, W.A.J., 1962. Workshop Technology, Part I, II, III, E.I.B.S. and Edward Arnold Publishers Ltd., London.
3. Chapman, W.A.J. 1965. Applied Workshop Calculations, Low Priced Textbook. The English Language Book Society and Edward Arnold (Publishers) Ltd.
4. Gupta, K.N. and Kaushik, J.P. 1998. Workshop Technology, Vol. I and II New Heights, Daryaganj, New Delhi.

5. SURVEYING AND LEVELING ECE 111   **3 (1+2)**

Surveying: Introduction, classification and basic principles, linear measurements. Chain surveying. Compass survey. Errors in measurements, their elimination and correction. Plane table surveying. Levelling, Contouring, Computation of area and volume. Theodolite traversing. Introduction to setting of curves.

Practical: Chain survey of an area and preparation of map; Compass survey of an area and plotting of compass survey; Plane table surveying; Leveling. L-section and X-sections and its plotting; Contour survey of an area and preparation of contour map; Introduction of software in drawing contour; Theodolite surveying; Ranging by theodolite, Height of object by using theodolite; Setting out curves by theodolite; Minor instruments.

Reference:

1. Agor, R. 1998. Surveying and Levelling, Khanna Publishers, New Delhi.
2. Kanetkar, T.P. and Kulkarni, S.P. 1965. Surveying and Levelling. A.V. Griha Prakashan, Pune-4.
3. Kochher, C.L. 1986. A Text book of Surveying. Vol. I and Vol. II. Katson Publishing House, Ludhiana.

6. ENGINEERING DRAWING   ECE 112

   2 (0+2)

Practical: Introduction of drawing scales; Principles of orthographic projections; References planes; Points and lines in space and traces of lines and planes; Auxiliary planes and true shapes of oblique plain surface; True length and inclination of lines; Projections of solids (Change of position method, alteration of ground lines); Section of solids and Interpenetration of solid-surfaces; Development of surfaces of geometrical solids; Isometric projection of geometrical solids.

Reference:

1. Bhatt, N.D. 1984. Elementary Engineering Drawing, Charotar Publishing House, Anand (Gujrat).
2. Dhawan, R.K. 1986. A text book of Engineering Drawing. Katson Publishing House, Ludhiana.
3. Gill, P.S. 1986. A text book of Geometrical Drawing. Katson Publishing House, Ludhiana.
4. Gill, P.S. 1986. Workbook on Engineering Drawing. Katson Publishing House, Ludhiana.

7. ENVIRONMENTAL SCIENCE   **EES 111**   **3 (3+0)**

Definition, Scope and Importance. Ecosystem: Types, structure and functions : Bio-diversity: value, threats and conservation. Natural Resources: forest, mineral, soil and water –their uses and abuses. Environmental pollution –Causes, effects and control measures of air, water, soil, marine, thermal and noise pollution. Nuclear hazards. Bio-safety and risk assessment. Rural and urban waste management. Global warming. Environmental act and related issues. Human population, health and social welfare.

References:

1. Environmental Engineering. Pandey, G.N. and Carney, G.C. 1997. Tata McGraw Hill Publishing Co. Ltd., New Delhi.

2. Environmental Pollution Control Engineering. Rao, C.S.1994. Wiley Eastern Ltd., New Age International Ltd., New Delhi.

3. Environmental Biotechnology, Michael, A.M. and Ojha, T.P. 1997. Principles of Agricultural Engineering, Vol. I, Vikas Publishing House P. Ltd. New Delhi.

8. ELECTRICAL CIRCUITS   EEL 111   3 (2+1)

Average and effective value of sinusoidal and linear periodic wave forms. Independent and dependent sources, loop current and loop equations (Mesh current method), node voltage and node equations(Nodal voltage method), Network theorems: Thevenin's, Norton's, Superposition, Reciprocity and Maximum power transfer, Star- Delta conversion solution of DC circuit by Network theorems, Sinusoidal steady state response of circuits, Instantaneous and average power, power factor, reactive and apparent power, Concept and analysis of balanced polyphase circuits, Laplace transform method of finding step response of DC circuits, Series and parallel resonance, Classification of filters, constant-k, m-derived, terminating half network and composite filters.

Practical: To familiarize with the components and equipments used in Laboratory; To verify Kirchhoff's current laws; To verify Kirchhoff's voltage laws; To verify Thevenin theorems; To verify Norton's theorems; To verify Superposition theorem; To verify reciprocity theorem; To study the sinusoidal response of RL series circuit; To study the sinusoidal response of RC series circuit; To study the step response of RL series circuit; To study the step response of RC series circuit; To study the response of constant K-filters; To study the response of m-derived filters; To study power consumed in a three-phase circuit.

References:

1. Del, V. 1998. Electrical Engineering Fundamentals Toro, Prentice Hall of India, New Delhi.
2. Edminister, J.A. 1998.Electric Circuits, Schaum's (Asain Students Edition) Hill, International Co. Singapore.
3. Nagrath, I.J. 1995. Basic Electrical Engineering. Tata Mc Graw Hill Pub. Co. Ltd.
4. Theraja, B.L. 2002. Fundamentals of Electrical Engineering and Electronics, Publication Div. of Niraja Construction, Dev. Co. New Delhi.

1. ENGINEERING MATHEMATICS-II   EMA-121   3 (3+0)

Matrices: Elementary transformations, rank of a matrix, reduction to normal form, Gauss-Jordon method to find inverse of a matrix, consistency and solution of linear equations, Eigen values and Eigen vectors, Cayley-Hamilton theorem, linear transformation, orthogonal transformations, diagonalisation of matrices, Bilinear and quadratic forms. Functions of a Complex variable: Limit, continuity and derivative of complex functions, analytic function, Cauchy-Reimann equations, conjugate functions, Harmonic functions. Fourier series: Infinite series and its convergence, periodic functions, Fourier series, Euler's formulae, Dirichlet's conditions, functions having arbitrary period, even and odd functions, half range series, Harmonic analysis. Partial differential equations: Formation of partial differential equations, Lagrange's linear equation, Higher order linear partial differential equations with constant coefficients, solution of non-linear partial differential equations, Charpit's method, application of partial differential equations (one dimensional wave and heat flow equations, two dimensional steady state heat flow equation (Laplace equation).

Reference:

1. Grewal, B.S. 1983. Higher Engineering Mathematics, Khanna Publishers, Delhi.
2. Jeffrey, A. 1979, Mathematics for Engineers and Scientists. The ELBS Publication Kenya.
3. Pipes, L.A. 1971. Applied Mathematics for Engineers and Physicists. McGraw Hill Book Co. Inc., New York.

2. COMPUTER PROGRAMMING AND DATA STRUCTURES   EEL 121   3 (1+ 2)

Introduction to high level languages, Primary data types and user defined data types, Variables, typecasting, Operators, Building and evaluating expressions, Standard library functions, Managing input and output, Decision making, Branching, Looping, Arrays, User defined functions, passing arguments and returning values, recursion, scope and visibility of a variable, String functions, Structures and union, Pointers, Stacks, Push/Pop operations, Queues, Insertion and deletion operations, Linked lists.
Practical: Familiarizing with Turbo C IDE; Building an executable version of C program; Debugging a C program; Developing and executing simple programs; Creating programs using decision making statements such as if, go to & switch; Developing program using loop statements while, do & for; Using nested control structures; Familiarizing with one and two dimensional arrays; Using string functions; Developing structures and union; Creating user defined functions; Using local, global & external variables; Using pointers; Implementing Stacks; Implementing push/pop functions; Creating queues; Developing linked lists in C language; Insertion/Deletion in data structures.

References:
1. Balagurusamy, E. 1999. Programming in BASIC. BPB Publications, New Delhi.
2. Balagurusamy, E. 1999. FORTRAN for Beginners. BPB Publications, New Delhi.
3. Bedi, J.S. 1998. Computer and Microprocessor. Khanna Publishers, New Delhi.
4. Singh, Sadhu, 1998. Computer Aided Design and Manufacturing. Khanna Publishers, New Delhi.
5. Pahiya, S. 2003. Data Communication and Computer Networks, 3rd Ed, Standard Publication, New Delhi.
6. Pahiya, S. 2003. Data Structures and Algorithms, 3rd Ed., Standard Publisher, New Delhi.
7. Singh, Sadua. 2006. Computer Aided Design and Manufacturing, Khanna Publisher, New Delhi.
8. Bedi, J.S. 2006. Computer and Micro Processor, Khanna Publisher, New Delhi.
9. Agrawal, D.C. 2006. Computer Communication ISWN System, Khanna Publisher, New Delhi.
10. Jain, L.C. 2006. Introduction to Microprocessor Using, Khanna Publisher, New Delhi.
11. Groover, M.P. and Zimmer, E.B. 2002. CAD/CAM, Computer Aided Design and Manufacturing, Printice Hall Pvt. Ltd., New Delhi.
12. Groover, M.P. 2002. Automation, Production Systems and Computer Integrated Manufacturing, Prentice Hall Pvt. Ltd., New Delhi.
13. Ghoshal, S. 2001. Computer Aided Analysis and Design, Prentice Hall Pvt. Ltd., New Delhi.

3. APPLIED ELECTRONICS AND INSTRUMENTATION   EEL 122   3(2+1)

Semiconductors, p-n junction, V-I characteristics of p-n junction, diode as a circuit element, rectifier, clipper, clamper, voltage multiplier, capacitive filter, diode circuits for OR & AND (both positive and negative logic), bipolar junction transistor: operating point, classification(A,B & C) of amplifier, various biasing methods (fixed, self, potential divider), h-parameter model of a transistor, analysis of small signal, CE amplifier, phase shift oscillator, analysis of differential amplifier using transistor, ideal OP-AMP characteristics, linear and non-linear applications of OP-AMP (adder, subtractor, integrator, active rectifier, comparator, differentiator, differential, instrumentation amplifier and oscillator), zener diode voltage regulator, transistor series regulator, current limiting, OP-AMP voltage regulators, Basic theorem of Boolean algebra, Combinational logic circuits(basic gates, SOP rule and K-map), binary ladder D/A converter, successive approximation A/D converter, generalized instrumentation, measurement of displacement, temperature, velocity, force and pressure using potentiometer, resistance thermometer, thermocouples, Borden tube, LVDT, strain gauge and tacho-generator.

Practical: To study V-I characteristics of p-n junction diode; To study half wave, full wave and bridge rectifier; To study transistor characteristics in CE configurations; To design and study fixed and self bias transistor; To design and study potential divider bias transistor; To study a diode as clipper and clamper; To study a OP-AMP IC 741 as inverting and non-inverting amplifier; To study a OP-AMP IC 741 as differentiator amplifier; To study a differential amplifier using two transistor; To study a OP-AMP IC 741 as differential amplifier; To study a zener regulator circuit; To study a OP-AMP IC 741 as a active rectifier; To study a OP-AMP IC 741 as a comparator; To familiarize with various types of transducers.

References:
1. Adams, L.F. 1975. Engineering Measurements and Instrumentation. The English University Press, London.
2. Nakara, B.C. and Chaudhary, K.K. 1996. Instrumentation Measurement and Analysis. Tata McGraw Hill Pub. Co. Ltd., New Delhi.
3. Sawhney, A.K. and Sawhney, J.K. 1998. A Course in Mechanical Measurement and Instrumentation, Dhanpat Rai and Co., Pvt. Ltd., New Delhi.

4. AGRICULTURE FOR ENGINEERS   EAG –121   4 (3+1)

Soils: Nature and origin of soil; soil forming rocks and minerals, their classification and composition, soil forming processes, classification of soils – soil taxonomy orders; important soil physical properties; and their importance; soil particle distribution; soil inorganic colloids – their composition, properties and origin of charge; ion exchange in soil and nutrient availability; soil organic matter – its composition and decomposition, effect on soil fertility; soil reaction – acid, saline and sodic soils; quality or irrigation water; essential plants nutrients – their functions and deficiency symptoms in plants; important inorganic fertilizers and their reactions in soils. Agronomy: Definition and scope of agronomy. Classification of crops, Effect of different weather parameters on crop growth and development. Principles of tillage, tilth and its characteristics. Soil water plant relationship and water requirement of crops, weeds and their control, crop rotation, cropping systems, Relay cropping and mixed cropping. Horticulture: Scope of horticultural and vegetable crops. Soil and climatic requirements for fruits, vegetables and floriculture crops, improved varieties, Criteria for site selection, layout and planting methods, nursery raising, macro and micro propagation methods, plant growing structures, pruning and training, fertilizer application, fertigation, irrigation methods, harvesting, grading and packaging, post harvest practices, Garden tools, management of orchard, Extraction and storage of vegetables seeds.

Practical: Identification of rocks and minerals; Examination of soil profile in the field; Determination of bulk density; particle density and porosity of soil; Determination of organic carbon of soil; Identification of crops and their varieties seeds and weeds; Fertilizer application methods; Different weed control methods; Judging maturity time for harvesting of crop; Study of seed viability and germination test; Identification and description of important fruit; flowers and vegetables crops; Study of different garden tools; Preparation of nursery bed; Practices of pruning and training in some important fruit crops.

Reference:
1. ICAR, 1997. Hand Book of Agriculture, ICAR Pub. New Delhi.
2. Martin, J.M., Leonard, W.H. and Stamp, D.L. 1976. Principles of Field crop production. Macmillon Publishing Co. Inc. New York.
3. Singh, Chidda, 2001. Modern Techniques of raising field crops. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Brady, N.C. 1999. The Nature and Properties of Soils. Tenth Ed. Prentice-Hall of India Pvt. Ltd., New Delhi.
5. Rai, M.M. 1998. Principles of Soil Science. Macmillon India Ltd., New Delhi.

5. WORKSHOP TECHNOLOGY   EME 121   3 (2+1)

Introduction to welding, types of welding, Oxyacetylene gas welding, types of flames, welding techniques and equipment. Principle of arc welding, equipment and tools. Casting processes. Classification, constructional details of center lathe, Main accessories and attachments. Main operations and tools used on center lathes. Types of shapers, Constructional details of standard shaper. Work holding devices, shaper tools and main operations. Types of drilling machines. Constructional details of pillar types and radial drilling machines. Work holding and tool holding devices. Main operations. Twist drills, drill angles and sizes. Types and classification. Constructional details and principles of operation of column and knee type universal milling machines. Plain milling cutter. Main operations on milling machine.

Practical: Introduction to welding equipment, processes tools, their use and precautions; Jobs on ARC welding – Lap joint, butt joint; T-Joint and corner joint in Arc welding; Gas welding Practice – Lab, butt and T-Joints; Introduction to metal casting equipment, tools and their use; Mould making using one-piece pattern and two pieces pattern; Demonstration of mould making using sweep pattern, and match plate patterns; Practical test; Introduction to machine shop machines and tools; Demonstration on Processes in machining and use of measuring instruments; Practical jobs on simple turning, step turning; Practical job on taper turning, drilling and threading; Operations on shaper and planer, changing a round MS rod into square section on a shaper; Demonstration of important operations on a milling machine, making a plot, gear tooth forming and indexing; Any additional job.

Reference:
1. Chapman, W.A.J., 1962. Workshop Technology, Part I, II, III, E.I.B.S. and Edward Arnold Publishers Ltd., London.
2. Chapman, W.A.J. 1965. Applied Workshop Calculations, Low Priced Textbook. The English Language Book Society and Edward Arnold (Publishers) Ltd.
3. Gupta, K.N. and Kaushik, J.P. 1998. Workshop Technology, Vol. I and II New Heights, Daryaganj, New Delhi.

6. THERMODYNAMICS AND HEAT ENGINES   EME - 122   4 (3+1)

Thermodynamics properties, closed and open system, flow and non-flow processes, gas laws, laws of thermodynamics, internal energy. Application of first law in heating and expansion of gases in non-flow processes. First law applied to steady flow processes. Kelvin-Planck and Claussius statements. Reversible processes, Carnot cycle, Carnot theorem. Entropy, physical concept of entropy, change of entropy of gases in thermodynamics processes. Difference between gas and vapour, change of phase during constant pressure process. Generation of steam, triple point and critical point. Internal energy and entropy of steam. Use of steam tables and Mollier chart, heating and expansion of vapour in non-flow processes, measurement of dryness fraction. Classification of steam boilers, Cochran, Lancashire, locomotive and Babcock-Wilcox boilers. Boiler mountings and accessories. Desirable properties of working fluid used for power plants. Rankine cycle. Expansive and non expansive working. Saturation curve and missing quantity, governing. Calculations of cylinder dimensions, Introduction to compound steam engines. Air Standard efficiency, other engine efficiencies and terms. Otto, diesel and dual cycles. Calculation of efficiency, mean effective pressure and their comparison. Measurement of IP, BP and heat balance calculations (not involving combustion). Engine efficiencies and performance.

Practical: Study of boilers; Study of various mountings and accessories of boilers; Study of steam engine; To measure dryness fraction of steam; Performance test of steam engine; Study of I.C. engines; Study of valve timing diagram of 2-stroke engines; Study of valve timing diagram of 4-stroke engines; Performance test on 2- cylinder diesel engines; Performance test and heat balance test on a four cylinder horizontal diesel engine; Practical test; To conduct Morse test on multi-cylinder petrol engine; Comparison of different temperature measuring methods; To verify inverse square law of radiation; To verify Stefan-Boltzman relationship; To determine the emissivity of a given material.

References:

1. Arora, N. 1972. Engineering Thermodynamics Problems, Dhanpat Rai and Sons. New Delhi.
2. Domkundwar : Thermal Engineering.
3. Ballaney, P.L. 1984. Thermal Engineering. Khanna Publishers, New Delhi.
4. Jones, F.R. 1970. Farm Gas Engines and Tractors, Mc Graw. Hill Book Co. New York and London.
5. Rai, G.D. 1998. Practical Thermodynamics. 1998. Khanna Publishers, New Delhi.

7. OPERATION & MAINTENANCE OF TRACTOR & FARM MACHINERY–I
FMP-121   1(0+1)

Practical: Introduction to various systems of a tractor viz. fuel, lubrication, cooling, electrical, transmission, hydraulic & final drive system. Familiarisation with tractor controls & learning procedure of tractor starting and stopping. Driving in forward and reverse gears. Driving safety rules. Hitching, adjustments, settings and field operation of farm machinery. Familiarisation with different makes & models of 4- wheeled tractors. Starting & stopping practice of the tractor. Familiarisation with instrumentation panel & controls; Road signs, traffic rules, road safety, driving & parking of tractor; Tractor driving practice forward & reverse driving practice; Tractor driving practice with two wheeled tractor trailer forward & reverse; Study and practising the hitching and dehitching of implements; Study operation and field adjustments of MB plough & disk plough; Field operation of trailing & mounted disk harrow; Field operation and adjustments of seed drill/planter/sprayer.

References:

1. Culpin, C. 1978. Farm Machinery. Granada Publishing Ltd., London.
2. Kepner, R.A., Bainer, R. and Barger, E.L. 1987. Principles of Farm Machinery. C.S.B. Publishers and distributors, New Delhi.
3. 3 Smith, H.P. and Wilkes, L.H. 1979.. Farm Machinery and Equipment. Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
4. Ojha, T.P. and Michael, A.M. 2001.Principals of Agricultural Engineering, Vol. I., Jain Brothers, New Delhi.
5. Sahay, J. 2001. Elements of Agricultural Engineering, Jain Brothers, New Delhi.
6. 6 Jain, S.C. and Rai, C.R. 2001. Farm Tractor Maintenance and Repair. Jain Brothers, New Delhi.
7. Liljedhi, B.L. 1990. Tractors and their Power Units, John Willey and Sons, New Delhi.

8. ENGINEERING MECHANICS   ECE – 121   3 (2+1)

Basic concepts. Force systems. Centroid. Moment of inertia. Free body diagram and equilibrium of forces. Frictional forces. Analysis of simple framed structures using methods of joints, methods of sections and graphical method. Simple stresses. Shear force and bending moment diagrams. Stresses in beams. Torsion. Analysis of plane and complex stresses.

Practical: Problems on; Composition and resolution of forces, moments of a force, couples, transmission of a couple, resolution of a force into a force & a couple; Problems relating to resultant of; a concurrent - coplaner force system, nonconcurrent - coplaner force system, nonconcurrent - noncoplaner force system, parallel - noncoplaner force system, system of couples in space; Problems relating to centroids of composite areas; Problems on moment of inertia, polar moment of inertia, radius of gyration, polar radius of gyration of composite areas; Equilibrium of concurrent – coplaner and nonconcurrent – coplaner force systems; Problems involving frictional forces; Analysis of simple trusses by method of joints and method of sections; Analysis of simple trusses by graphical method; Problems relating to simple stresses and strains; Problems on shear force and bending moment diagrams; Problems relating to stresses in beams; Problems on torsion of shafts; Analysis of plane and complex stresses.

Reference:

1. Bruch, C.D. 1976. Mechanics for Technology. Johd. Wilcy & Sons, New York, London.
2. Dhawan, R.K. 1986. Engineering Mechanics and S.O.M. Katson Publishing House, Ludhiana.
3. Junnarkar, S.B. 1965. Elements of Applied Mechanics. Charotar Book Stall, Anand.
4. Khurmi, R.S. 1984. A text book of Applied Mechanics. S. Chand and Co. Ltd., New Delhi.
5. Prasad, I.B. Applied Mechanics, 1998. Khanna Publishers, New Delhi.