

Semester - II

Sr. No.	Course Name	Course No.	Credit	L	P	T
1	Engineering Mathematics-II	Maths (E)-102	3 (2+1)	2	0	1
<p>Course content :</p> <p>Matrices: Elementary transformations, rank of a matrix, reduction to normal form, Gauss-Jordan 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.</p> <p>Functions of a Complex Variable: Limit, continuity and derivative of complex functions, analytic function, Cauchy-Reimann equations, conjugate functions, Harmonic functions.</p> <p>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.</p> <p>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).</p>						
Planning of lectures						
S.No.	Topics to be covered in Lecture / Tutorial					Proposed No. of Lectures/ Tutorials
1	Elementary transformation and rank of a matrix, reduction to normal form, Gauss-Jordan method to find inverse of a matrix					3
2	Solution of system of linear equations					3
3	Eigen value and vectors, Cayley-Hamilton theorem					2
4	Linear and orthogonal transformations					1
5	Diagonalization of matrices, Bilinear, Quadratic forms					2
6	Complex variable : Limit, continuity, derivative of function of complex variable					3
7	Analytical function, C-R equations, conjugate function, harmonic functions					2
8	Fourier series: Infinite series and its convergence, periodic function, Euler's formulae for calculating Fourier coefficients, Dirichlet's conditions					2
9	Fourier series of functions with period 2π					2
10	Fourier series of functions with arbitrary period					3
11	Fourier series of odd and even functions					2
12	Half range sine and cosine series, Harmonic analysis					3
13	Partial differential equations: Formation of partial differential equations					4
14	Lagrange's linear equation					2
15	Higher order linear partial differential equation with constant coefficients					4
16	Solution of non-linear partial differential equation (Charpit's method)					3
17	Application of partial differential equations: One dimensional wave e.q, one dimensional heat equation, two dimensional steady state heat equation i.e. Laplace equation					6
Total					47	

Reference Books

- Higher Engineering Mathematics, Vol-I,II , By: Dr. K. R. Kachot
- Higher Engineering Mathematics , By: Dr. B. S. Graval
- A Text Book Of Engineering Mathematics , By: N. P. Bali and Ashok Saxena
- Schaum's Outline Series: Theory and Problems of Complex variable , By: Murray R. Spigel
- Schaum's Outline Series: Theory and Problems of Matrices , By: Frank Ayres
- Advance Engineering Mathematics , By: Erwin Kreyszing
- Schaum's Outline Series: Theory and Problems of Advance calculus , By: Murray R. Spigel
- Text book of matrices, By: Shanti Narayan and P. K Mittal

Sr. No.	Course Name	Course No.	Credit	L	P	T
2	Computers Programming and Data Structures	PFE - 102	3 (1 + 2)	1	2	0
Course content :						
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						
Planning of lectures						
S.No.	Topics to be covered in Lecture					Proposed No. of Lectures
1	Introduction to high-level languages.					1
2	Primary data types and user defined data types.					2
3	Variables, typecasting, Operators.					1
4	Building and evaluating expressions.					2
5	Standard library functions.					1
6	Managing input and output.					1
7	Decision-making, Branching, Looping, Arrays.					2
8	User defined functions, String functions.					1
9	Passing arguments and returning values.					1
10	Recursion, scope and visibility of a variable.					1
11	Structures and union.					1
12	Pointers, Stacks, Push/Pop operations.					1
13	Queues, Insertion and deletion operations, linked lists.					1
Total					16	
Practicals						
S.No.	Topic					No. of Practicals
1	Familiarizing with Turbo C ID					2
2	Building an executable version of C program					1
3	Debugging a C program					4
4	Developing and executing simple programs					3
5	Creating programs using Decision making statements such as if, go to & switch					2
6	Developing program using loop statements while, do & for					3
7	Using nested control structures					1

8	Familiarizing with one and two dimensional arrays.	2
9	Using string functions	3
10	Developing structures and union	1
11	Creating user defined functions	1
12	Using local, global & external variables	1
13	Using pointers	1
14	Implementing Stacks	1
15	Implementing push/pop functions	1
16	Creating Queues	1
17	Developing linked lists in C language	1
18	Insertion/Deletion in data structures	1
	Total	30

Reference Books

- Programming in ANCI , By:C, E. Balagurusamy,
- The C programming Language, By: Brian W. Kernighan, Dennis M. Ritchie,
- Introduction to Data Structures in C, By: Ashok N. Kamthane,
- Data Structures and Algorithms, By: Aho A. V., J. E. Hopcroft, J.D. Ullman Addison-Wesley, 1983
- Algorithms Design and Analysis, , By: Horowitz, E., S. Sahni
- Fundamentals of Data Structures in PASCAL, , By: Horowitz E., S. Sahni

S.No.	Course Name	Course No.	Credit	L	P	T
3	Surveying and Leveling	R E - 101	3 (1 + 2)	1	2	0

Course content :

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

Planning of lectures

S.No.	Topics to be covered in Lecture	Proposed No. of Lectures
1	Surveying Introduction	1
2	classification and basic principles Linear measurements	1
3	Chain Surveying. Compass survey	2
4	Errors in measurements, their elimination and correction	1
5	Plane table surveying.	2
6	Levelling.	2
7	Contouring,	3
8	Computation of area and volume	1
9	Theodolite traversing..	2
10	Introduction to setting of curves	1
	Total	15

Practicals

S.No.	Topic	No. of Practicals
1	Chain survey of an area and preparation of map	6
2	Compass survey of an area and Plotting of compass survey	4
3	Plane table surveying	5
4	Leveling. L section and X-sections and its plotting	5
5	Contour survey of an area and preparation of contour map	4

6	Introduction of software in drawing contour	1
7	Theodolite surveying	3
8	Ranging by theodolite, Height of object by using theodolite	1
9	Setting out curves by theodolite	2
10	Minor instruments	1
	Total	32
Reference Books		
<ul style="list-style-type: none"> • Surveying , By: C.L. Kochher, Kataria • Surveying and Levelling Vol.1&2 , By: T.P. Kanetkar and S.V. Kulkarni, • Surveying Vol.1&2 , By: B.C. Punmia, 		

Sr. No.	Course Name	Course No.	Credit	L	P	T
4	Agriculture for Engineers	Agri (E) - 102	4 (3 + 1)	3	1	0
Course content :						
<p>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.</p> <p>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.</p> <p>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.</p>						
Planning of lectures						
S.No.	Topics to be covered in Lecture					Proposed No. of Lectures
	Soils					
1	Nature and origin of soil; soil forming rocks and minerals, their classification and composition					2
2	Soil forming processes, classification of soils – soil taxonomy orders; important soil physical properties; and their importance; soil particle distribution					3
3	Soil inorganic colloids – their composition, properties and origin of charge; ion exchange in soil and nutrient availability					3
4	soil organic matter – its composition and decomposition, effect on soil fertility; soil reaction – acid, saline and sodic soils					3
5	Quality or irrigation water					2
6	Essential plants nutrients – their functions and deficiency symptoms in plants					2
7	Important inorganic fertilizers and their reactions in soils					2

	Agronomy	
8	Definition and scope of agronomy	2
9	Classification of crops	2
10	Effect of different weather parameters on crop growth and development	2
11	Principles of tillage, tilth and its characteristics	2
12	Soil water plant relationship and water requirement of crops	2
13	weeds and their control	2
14	Crop rotation, cropping systems, Relay cropping and mixed cropping.	2
	Horticulture	
15	Scope of horticultural and vegetable crops	1
16	Soil and climatic requirements for fruits, vegetables and floriculture crops, improved varieties	2
17	Criteria for site selection, layout and planting methods, nursery raising	2
18	Macro and micro propagation methods,	3
19	Plant growing structures, pruning and training	2
20	Fertilizer application, fertigation, irrigation methods	1
21	Harvesting, grading and packaging, post harvest practices	2
22	Garden tools, management of orchard	1
23	Extraction and storage of vegetables seeds.	1
	Total	48
Practicals		
S.No.		No. of Practical
1	Identification of rocks and minerals;	1
2	Examination of soil profile in the field;	1
3	Determination of bulk density; particle density and porosity of soil;	1
4	Determination of organic carbon of soil	1
5	Identification of crops and their varieties seeds and weeds;	1
6	Fertilizer application methods;	1
7	Different weed control methods;	1
8	Judging maturity time for harvesting of crop	1
9	Study of seed viability and germination test;	1
10	Identification and description of important fruit; flowers and vegetables crops;	3
11	Study of different garden tools;	1
12	Preparation of nursery bed;	1
13	Practices of pruning and training in some important fruit crops.	1
	Total	15
Reference Books		
<ul style="list-style-type: none"> • The Nature and Properties of Soil, By: N.C. Brady and R.R. Weil • Fundamentals of Soil Science, Ed By ICAR, • Chemistry of Soil, By: E.E. Bear • Principles of Agronomy, By: T. Y. Reddy and G. H. Shankara Reddy • Fundamentals of Agronomy,By: Rajat D. • Principles and Practices of Agronomy,By: S. S. Singh • Introductuion of Agronomy, By: V. W. Vaidya and K. R. Shahastrabudher • Principles of Horticulture, By: Prasad and Kumar • Principles of Horticulture, By: Denison • Horticultural Science, By: J Janick • Plant Propogation : Principles and Practices, By: Hartmen and Kester 		

Sr. No.	Course Name	Course No.	Credit	L	P	T
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5	Workshop Technology	FMP - 102	3 (2 + 1)	2	1	0
Course content :						
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.						
Planning of lectures						
S.No.	Topics to be covered in Lecture					Proposed No. of Lectures
1	Introduction to welding, types of welding, oxyacetylene gas welding, types of flame					3
2	Arc welding technologies and equipments					3
3	Casting process					3
4	Classification, construction details of center lathe, main accessories and attachment					3
5	Main operations and tools used in centre lathe					3
6	Type of shaper, construction details of standard shaper, work holding devices shaper tools, operation					2
7	Type of drilling machines, construction details of pillar type and radial drilling machine					3
8	Work holding and tool holding device and main drilling operations					3
9	Twist drills, drill angles and sizes					2
10	Classification of different types of milling machine					1
11	Constructional details and principle of operation of column and knee type milling machine					2
12	Types of milling cutter and operation on milling machines					2
	Total					30
Practicals						
S.No.	Topic					No. of Practical
1	Study of shop lay-out fitting shop, carpentry shop, black smithy shop.					1
2	To prepare a single piece pattern by wood working operation					1
3	To prepare half lap joint by wood working operation					1
4	To prepare Dove-tail joint by wood working operation					1
5	To prepare Mortised joint by wood working operation					1
6	To prepare Tennon joint by wood working operation					1
7	To prepare square bar out of cylindrical bar by cold working process					1
8	To prepare hexagonal chisel by hot working process					1
9	To prepare chipping hammer by hot working process					1
10	To prepare khurpi by hot working process					1
11	To prepare I hook by hot working process					1
12	To prepare a lap joint of galvanized/ M.S. sheet by punching , drilling, and riveting operation					1
13	To prepare m.s. square plates by filing, cutting, with hacksaw, drilling, ramming, threading with tap and die and assembly processes					1
14	To prepare male and female (C & T) parts by different fitting operations					1

	Total	14
Reference Books		
<ul style="list-style-type: none"> • Workshop Technology Vol. I & II , By: S.K. Hajra Chaudhary • Workshop Technology , By: Chapman • Workshop Technology , By: S.K. Gupta • Manufacturing Technology , By: S. Dalela 		

Sr. No.	Course Name	Course No.	Credit	L	P	T
6	Engineering Mechanics	FMP - 104	3 (2 + 1)	2	1	0

Course content :

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

Planning of lectures

S.No.	Topics to be covered in Lecture	Proposed No. of Lectures
1	Basic concept of engineering mechanics	2
2	Force system, free body diagram and equilibrium of forces	4
3	Centroid moment of inertia	4
4	Friction and frictional forces	4
5	Analysis of simple frames structure using method of joints, method of section and graphical method	4
6	Simple stresses, shear force and bending moment diagrams	5
7	Stresses in beams, torsion	4
8	Analysis of plane and complex stresses	3
	Total	30

Practicals

S.No.	Topic	No. of Practicals
1	To study and verify law of parallelogram of forces	1
2	To study and verify Lami's theorem	1
3	To study and verify the law of Polygon of forces	1
4	To determine the co-efficient of friction between two surfaces for horizontal plane	1
5	To determine the co-efficient of friction between two surfaces for incline plane	1
6	To determine moment of inertia of a flywheel	1
7	To study the machine and verify the law of triangle of forces on jib crane	1
8	To determine mechanical advantage, velocity ratio, efficiency and friction present in simple screw jack machine	1
9	To carry out torsion test on circular specimen and to find out modulus of rigidity	1
10	To determine the law of machine on single purchase crab and to find efficiency of the machine	1
11	To study the problem on simple supported beams and roller and hinged supported beams by analytical and graphical methods.	1
	Total	11

Reference Books

- Engineering Mechanics , By: R.S. Khurmi & Gupta
- Engineering Mechanics, By: R. K. Bansal
- Engineering Mechanics , By: R.V. Kulkarni
- Engineering Mechanics , By: S.C. Arora
- Engineering Mechanics (Vol. I) Statics , By: Archie Higdon and William B. Stiles,
- Strength of Materials , By: S. Ramanurutham & R. Narayanan,
- Analysis of Structures Vol. I & Vol. II , By: V. M. Vazirani & M. M. Ratwani
- Mechanics of materials , By: E. P. Popov,
- Applied Mechanics & Strength of Materials , By: I. B. Prasad

Sr. No.	Course Name	Course No.	Credit	L	P	T
7	Thermodynamics and Heat Engines	FMP - 106	4 (3 + 1)	3	1	0

Course content :

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 Clausius 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.

Planning of lectures

S.No.	Topics to be covered in Lecture	Proposed No. of Lectures
1	Thermodynamics properties, closed and open system, flow and non flow processes	2
2	Gas laws, laws of thermodynamics, internal energy	2
3	Application of 1 st law in heating and expansion of gases in non flow processes	2
4	1 st law applied to steady flow processes	2
5	Kelvin-Planck and Clausius Statements, reversible processes, Carnot cycle, Carnot theorem	2
6	Entropy, physical concept of entropy, change of entropy of gases in thermodynamics processes	2
7	Difference between gas and vapour, change of phase during constant	2

	pressure process	
8	Generation of steam, triple point and critical point, internal energy and entropy of steam	2
9	Use of steam tables and moiler charts, heating and expansion of vapour	2
10	Non flow processes, measurement of dryness fraction	2
11	Classification of steam boilers, cocharan, Lancashire, locomotive and babcock – Wilcox boilers	2
12	Boiler mountings and accessories	2
13	Desirable properties of working fluid used for power plants non expansive working	2
14	Saturation curve and missing quantity governing	2
15	Calculations of cylinder dimensions,	2
16	Introduction to compound steam engines	2
17	Air standard efficiency, other engines efficiencies and terms	3
18	Otto, diesel and dual cycle, calculation of efficiency	3
19	Mean effective pressure and their comparison	2
20	Measurement of IP, BP and heat balance calculations (not involving combustion	2
21	Engine efficiencies and performance	2
22	Revision and doubts	2
	Total	46
Practicals		
S.No.	Topic	No. of Practicals
1	Study of boilers	1
2	Study of various mountings and accessories of boilers	1
3	Study of steam engines	1
4	To measure dryness fraction of steam	1
5	Study of performance test of steam engine	1
6	Study of I.C. engines-	2
7	Study of valve timing diagram of 2 – stroke engines	1
8	Study of valve timing diagram of 4- stroke engines	1
9	Performance test on 2 cylinder diesel engines	1
10	Performance test and heat balance test on a four cylinder horizontal diesel engine	1
11	To study about Morse test on multi cylinder petrol engine	1
12	Comparison of different temperature measuring methods	1
13	To verify inverse square law of radiation and Stefan- Boltzmann relationship	1
14	To study about the emissivity of a given material	1
	Total	15
Reference Books		
<ul style="list-style-type: none"> • Engineering Thermodynamics , By: C.P. Gupta & Rajendra Prakash • Thermal Engg. , By: P.L. Ballaney • Elements of heat engines (Vol II) , By: R.C. Patel & C.J. Karamchandani • Basic Mechanical Engg. , By: R.P. Arora, B.K. Raghunath, J.P. Patel • Basic Engg. Thermodynamics , By: T. Roy Choudhary • Internal combustion Engines, By: H.B. Keswani 		