

Dept. of FS -

No.	Course No.	Title	Credits		
			T	P	Total
1	FS 111	Engineering Mechanics	2	1	3
2	FS 122	Strength of Materials	1	1	2
3	FS 233	Theory of Structures	1	1	2
4	FS 244	Building Construction and Cost Estimation	1	1	2
5	FS 355	Agricultural Structures, Storage Engineering and Environmental Control	2	1	3
Total			07	05	12

FS Dept.New Syllabus –

Course No. : FS-111 Course Title : Engineering Mechanics
Semester : I Credits : 3(2+1)

Syllabus

Theory:

Basic concepts of Engineering Mechanics. 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; Co-planer force system, collinear force system, concurrent force system, co-planer concurrent force system, co-planer non-concurrent force system, Non-coplaner concurrent force system, Non-coplaner non-concurrent 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 – co-planer and non concurrent – co-planer 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.

Teaching Schedule

Lect. No.	Topic	Book No.	Article No.	Page No.	Weightages %
1	Introduction	1	1.1 to 1.13	1-4	25%
2-3	Composition and Resolution of Forces	1	2.1 to 2.18	13-26	
4-6	Moments, Parallel forces and Couples	1	3.1-3.8, 4.1 to 4.6 and 4.8 to 4.14	28-33, 43-46 and 49-54	
7-8	Equilibrium of forces	1	5.1 to 5.10	55-74	25%
9-11	Centre of gravity	1	6.1 to 6.11	78-93	
12-14	Moment of Inertia	1	7.1 to 7.15	100 to 118	
15-16	Friction	1	8.1 to 8.11	124 to 131	25%
17-18	Principles of lifting machines	1	10.1 to 10.18	171 to 183	
19-22	Simple lifting machines – simple wheel and axle, differential wheel and axle, worm and worm wheel, single purchase crab winch, double purchase crab winch and simple screw jack.	1	11.1 to 11.5, 11.7 to 11.9 and 11.15	185 to 192	
23-25	Support reactions	1	12.1 to 12.23	217 to 242	25%
26-28	Analysis of perfect frames – Analytical	1	13.1 to 13.14	244 to 250	
29-30	Analysis of perfect frames – Graphical method	1	14.1-14.6	289-298	

Practical Exercises:

Sr. No	Title
1	Determination of magnitude and direction of resultant force of concurrent and non-concurrent forces by Graphical method.
2	Determination of magnitude and direction of resultant force of parallel forces by graphical method.
3	Verification Lami's theorem.
4	Verification the law of Triangle of forces.
5	Verification the law of Parallelogram of forces.
6	Verification of law of Polygon of forces.
7	Determination of C.G of given shapes.
8	Determination of coefficient of friction and angle of friction.
9	Determination M. A., V. R. and efficiency of simple wheel and axle.
10	Determination M. A., V. R. and efficiency of differential wheel and axle.
11	Determination M. A., V. R. and efficiency of single purchase crab winch.
12	Determination M. A., V. R. and efficiency of simple screw jack.
13	Determination of support reaction for a beam.
14	Analysis of perfect frame using analytical method.
15	Analysis of perfect frame using graphical method.

Suggested readings

Books:

Author	Year	Title	Publisher
Text Book			
R.S. Khurmi	2008	A text book of Engineering Mechanics	S. Chand and company ltd., Ramnagar, New Delhi
Reference Books			
Sundarajan V	2002	Engineering Mechanics and Dynamics	Tata McGraw Hill Publishing Co. Ltd., New Delhi.
Timoshenko S and Young D H	2003	Engineering Mechanics	McGraw Hill Book Co., New Delhi
Prasad I B	2004	Applied Mechanics	Khanna Publishers, New Delhi
Prasad I B	2004	Applied Mechanics and Strength of Materials	Khanna Publishers, New Delhi
Bansal R K	2005	A Text Book of Engineering Mechanics	Laxmi Publishers, New Delhi

Course No.	: FS 122	Course Title	:	Strength of Materials
Semester	: II	Credits	:	2 (1+1)

Syllabus

Theory:

Slope and deflection of beams using integration techniques, moment area theorems and conjugate beam method. Columns and Struts. Riveted and welded connections. Stability of masonry dams. Analysis of statically intermediate beams. Propped beams. Fixed and continuous beam analysis using superposition, three moment equation and moment distribution methods.

Practical:

To perform the tension test on metal specimen (M.S., C.I.), to observe the behaviour of materials under load, to calculate the value of E, ultimate stress, permissible stress, percentage elongation etc. and to study its fracture; To perform the compression test on; Concrete cylinders & cubes, C.I., M.S. & Wood specimens and to determine various physical and mechanical properties; To perform the bending test on the specimens; M.S. Girder, Wooden beam, Plain concrete beams & R.C.C. beam, and to determine the various physical and mechanical properties; To determine Young's modulus of elasticity of beam with the help of deflection produced at centre due to loads placed at centre & quarter points; To study the behaviour of materials (G.I. pipes, M.S., C.I.) under torsion and to evaluate various elastic constants; To study load deflection and other physical properties of closely coiled helical spring in tension and compression; To perform the Rockwell, Vicker's and Brinell's Hardness tests on the given specimens; To perform the Drop Hammer Test, Izod Test and Charpay's impact tests on the given specimens; To determine compressive & tensile strength of cement after making cubes and briquettes; To measure workability of concrete (slump test, compaction factor test); To determine voids ratio & bulk density of cement, fine aggregates and coarse aggregates; To determine fatigue strength of a given specimen; To write detail report emphasizing engineering importance of performing tension, compression, bending, torsion, impact and hardness tests on the materials.

Teaching Schedule

Lect. No.	Topic	Text Book	Article No.	Page No.	Weight-age, %	Unit
1-2	Simple stresses and strains, Stresses and strains in bars of varying sections	1	2.1 to 2.11 and 3.1 to 3.5	12 to 18 and 25 to 39	25%	I
3-4	Elastic constants	1	6.1 to 6.13	86 to 100		
5-8	Bending moment and shear force	1	13.1 to 13.9 and 13.11 to 13.12	286 to 292 and 296 to 304	25%	III
9-10	Bending stresses in simple beams	1	14.1 to 14.10	344 to 363		
11	Direct and bending stresses	1	17.1 to 17.4 and 17.7	385 to 389 and 398 to 400	25%	III
12	Deflection of beams –by integration method	1	19.1 and 19.3 to 19.7	463 to 474		
13-14	Riveted joints	1	29.1 to 29.25	664-680	25%	IV
15-16	Columns and struts	1	32.1 to 32.5, 32.8 and 32.9 and 32.11 to 32.13	723-734		

Practical Exercises:

Sr. No	Title
1	To perform tension test on mild steel bar.
2	To perform impact test on course aggregate.
3	To determine crushing strength of concrete cube.
4	To determine flexural strength of timber.
5	To determine Young's Modulus of elasticity of wire.

6	Determination of stiffness of helical spring.
7	Determination of modulus of rigidity of steel rod by torsion test.
8	To determine hardness of various metals.
9	To determine shear strength of mild steel bars using UTM.
10	Problems on shear force and bending moment.
11	Problems on simple bending stresses.
12	Problems on deflection of beams.
13	Problems on stability of dam.
14	Problems on design of riveted joints.
15	Problems on design of welded joints

Suggested readings

Author	Year	Title	Publisher
Text Book			
R.S. Khurmi	2013	Strength of Materials (SI Units)	S. Chand and company ltd., Ramnagar, New Delhi
Reference Books			
S. Timoshenko and D.H. Young	2012	Elements of Strength of Materials	East-West press private limited, New Delhi
S. Ramamrutham	2012	Strength of Materials	DhanpatRai and Sons, New Delhi
Junarkar S.B	2001	Mechanics of Structures (Vo-I)	Charotar Publishing House, Anand

Course No. : FS-233

Course Title : **Theory of Structures**

Semester : III

Credits : 2(1+1)

Syllabus

Theory

Loads and use of BIS Codes. Design of connections. Design of structural steel members in tension, compression and bending. Design of steel roof truss. Analysis and design of singly and doubly reinforced sections, Shear, Bond and Torsion. Design of Flanged Beams, Slabs, Columns, Foundations, Retaining walls and Silos.

Practical

Design and drawing of single reinforced beam, double reinforced beam, Design and drawing of steel roof truss; Design and drawing of one way, two way slabs, Design and drawing of RCC building; Design and drawing of Retaining wall. To measure workability of cement by slump test.

Teaching Schedule

Lect. No.	Topic	Book No.	Article No.	Page No.	Weightage %
Part-1 – Steel Structures					
1	Introduction Characteristic strength and characteristics load, partial safety factors for load & material.	1 2	1.1 to 1.3 1.1 to 1.9, 1.11 -1.12	1 to 3 1 to 23	20%
2-3	Tension members	1	4.1 to 4.4	54 to 71	
4-5	Compression member	1	5.1 to 5.7	77 to 92	
6-7	Industrial sheds	1	9.1 to 9.2	201 to 223	20%
Part-2 – RCC Structures					
8-9	Analysis and design of singly (LSM) reinforced sections.	2	3.1 to 3.6	50 to 66	20%
10-11	Analysis and design of doubly reinforced sections	2	4.1 to 4.3	71 to 87	
12-13	Design of one way slab Design of two way slab	2	10.1 to 10.5	233 to 266	20%
14-15	Design of axially loaded short columns	2	12.1 to 12.4	355 to 375	20%
16	Types of footing, design of Isolated RCC footing	2	13.1 to 13.5	419 to 440	

Practical Exercises:

SN	Title
1	To study standard rolled steel sections and use of steel table to find their properties.
2	Drawing of various types of trusses.
3	Design and drawing of industrial truss.
4	Problem on design wind pressure for sloping roof.
5	Design and drawing of tension members

6	Design and drawing of compression members
7	Design and drawing of RCC slab and beam of a farm house.
8	Design and drawing of column and footing of farm house.
9	Drawing of various retaining wall.
10	Design and drawing of silos.

Course No. : FS-244 Course Title : Building Construction and Cost Estimation
Semester : IV Credits : 2(1+1)

Syllabus

Theory:

Building Materials: Rocks, Stones, Bricks Properties and varieties of Tiles, Lime, Cement, Concrete, Sand. Glass, Rubber, Plastics, iron, Steel, Aluminium, Copper, Nickel. Timber. Building components: Lintels, Arches, stair cases, Different types of floors, Finishing: Damp Proofing and water proofing, Plastering, pointing, white washing and distempering – Painting, Building design, Design procedures, Technology, building construction, Types of agricultural buildings and related needs, application of design theory and practice to the conservation, sloped and flat roof buildings, construction economics: Preliminary estimates, Detailed Estimates of Buildings source of cost information, use of cost analyses for controlling design, 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.

Practical:

Testing of stones, bricks, cement, sand, aggregates, workability of cement, timber, components of agriculture structures, material and cost estimation of agriculture structures.

Teaching Schedule

Lect. No.	Topic	Book No.	Article No.	Page No.	Weightage %
1	Stones- Classification, uses, Quarrying, Characteristics	1	1.1 to 1.5	1-8	25%
2	Bricks – Preparation, types, classification, testing	1	2.1 to 2.13	15-23	
3	Cement – types, grades, storage, testing	1	5.5 to 5.10	38 – 48	
4	Cement concrete – ingredients, water cement ratio, specifications, properties, mixing, placing, curing	1	11.1 to 11.7	85 – 89	25%
5	Aggregates	1	7.1 to 7.3 8.1 to 8.4	55-56 62-64	
6	Rubber – Natural, polymer/synthetic, vulcanization, uses	1	23.1 to 23.7	182-184	
7	Plastics – polymerization, classification, properties	1	24.1 to 24.5	185-188	25%
8	Building components- Arches Lintels	2 2	-	286-292 302-304	
9	Roofs Floors	2	-	391-396 425-430	
10	Doors and windows – types, ledged doors	2	-	309-316	
11	Pointing and plastering	2	-	689-693	25%
12-13	Painting and distempering	2	-	707-717	
14	Methods of estimates	3 4	2.1, 4.1	4-6 2-4, 32-33	
15	Factors considered during preparation of estimates	4	2.9	77	

Practical Exercises:

SN	Title
1.	Study of different types of rocks.
2.	Study of water absorption of stone and brick materials.
3.	Determination of soundness of cement by Lechatelier apparatus.
4.	To determine fineness of cement.

5.	Test of adhesiveness of mortar to building units.
6.	To determine standard consistency of cement.
7.	To determine initial setting time of cement.
8.	To test workability of cement by Slump cone method.
9.	To test workability of cement by Compaction factor method.
10.	Determination of Bulking of sand and silt content in the sand.
11.	To determine void ratio and bulk density of fine aggregate and coarse aggregate.
12.	Study of market forms of timber.
13.	Measurement of components of an agricultural structure.
14.	Preparation of an estimate of agricultural structure.
15.	Visit to a construction site and to brick kiln / cement factory/ stone quarry / other building material.

Suggested readings:-

Author	Year	Title	Publisher
Text Book			
P.C. Verghese	2005	Building Materials	PHI Learning Private Limited, M-97, Connaught Circus, New Delhi – 110001
S.C. Rangwala	2007	Building Construction	Charotar Publishing House, Oppo. Amul Dairy, Court road, Anand – 388001
B.N. Dutta	1993	Estimating and Costing in Civil Engineering – Theory and Practice	UBS publishers’ Distributors Ltd., 5 Ansari Road, New Delhi – 110002
M. Chakraborti	2012	Estimating, Costing, Specification and Valuation in Civil Engineering	Monojit Chakraborti, 21 B, Bhabananda, Kolkatta – 700026
Reference Books			
Punmia B.C. Ashok Kumar Jain and Arun Kumar Jain	2000	Building Construction	Laxmi Publications (P) ltd., New Delhi
Duggal S K	2000	Building material	New Age International Publishers
Sane Y.S	2000	Planning and Designing	Charotar Publishing House, Anand

Author	Year	Title	Publisher
		of Buildings	
Rangwala S C	1994	Engineering Materials	Charotar Publishing House, Anand

Suggested readings

Author	Year	Title	Publisher
Text Book			
L. S. Negi	2012	Design of steel structures	TataMcgraw-hill, New Delhi
V. L. Shah & S. R. Karve	2008	Illustrated Reinforced Concrete Design	Structures publications, Pune
Reference Books			
T.P. Ojha and A.M. Michael	2003	Principles of Agricultural Engineering Volume-I	Jain Brothers, New Delhi
V. L. Saha & Dr. S.R. Karve	2012	Limit state theory and design of reinforced concrete	Structures publishers, Pune
N. KrishanRaju and R.N. Pranesh	2012	Reinforced concrete design (IS 456-2000) Principles and practice	New Age International
N.C. Sinha and S.K. Roy		Fundamentals of reinforced concrete	S. chand and company
S.K. Duggal	2011	Design of steel structure	Tata Mcgraw-hill, New Delhi.
M. Raghupati	2011	Design of steel structure	TataMcgraw-hill, New Delhi
Ramchandra	2010	Design of steel structure	Dhanpatrai and sons Publication Company, New Delhi
Sushilkumar	2000	RCC design	Standard book house , New Delhi
M.G.Shah and C.M.Kale	1984	RCC Theory and design	MACMILLAN , Delhi

Course No. FS-355	Course Title :- Agricultural Structures, Storage Engineering and Environmental Control
Semester:- V	Credits:- 3(2+1)

Syllabus

Theory

Planning and layout of farmstead. Scope, importance and need for environmental control, physiological reaction of livestock environmental factors, environmental control systems and their design, control of temperature, humidity and other air constituents by ventilation and other methods, Livestock production facilities, BIS Standards for dairy, piggery, poultry and other farm structures. Design, construction and cost estimation of farm structures; animal shelters, compost pit, fodder silo, fencing and implement sheds, barn for cows, buffalo, poultry, etc. Storage of grains, Causes of spoilage, Water activity for low and high moisture food and its limits for storage, Moisture and temperature changes in grain bins; Traditional storage structures and their improvements, Improved storage structures (CAP, hermetic storage, Pusa bin, RCC ring bins), Design consideration for grain storage godowns, Bag storage structures, Shallow and Deep bin, Calculation of pressure in bins, Storage of seeds. Rural living and development, rural roads, their construction cost and repair and maintenance. Sources of water supply, norms of water supply for human being and animals, drinking water standards and water treatment suitable to rural community. Site and orientation of building in regard to sanitation, community sanitation system; sewage system and its design, cost and maintenance, design of septic tank for small family. Estimation of domestic power requirement, source of power supply and electrification of rural housing.

Practical

Measurements for environmental parameters and cooling load of a farm building, Design and layout of a dairy farm, Design and layout of a poultry house, Design and layout of a goat house/sheep house, Design of a farm fencing system, Design of a feed/fodder storage structures, Design of grain storage structures, Design and layout of commercial bag and bulk storage facilities, Study and performance evaluation of different domestic structures.

Teaching schedule theory with weightages(%)

Lect. No.	Topic	Book No.	Article No.	Page No.	Weightage
1	Farmstead planning- introduction, location, size and arrangement. Defects in traditional houses	1	-	568 to 572	25%
2	Improved farm house design.	1	-	572 to 576	
3-4	Dairy barn- types and equipments.	1	-	606 to 613	
5	Milking center- milking parlour and milk room	2	-	546 to 550	
6	Types of poultry houses	1	12.8	617 to 623	
9-10	Housing for pullet rearing and boiler production, site selection and building design, environmental control, brooder and growing house operation, laying house operation, lighting and miscellaneous features.	2	-	579-584	
11	Sheep housing	1	-	627 to 630	
12-13	Hay, grain and silage storage.	2	-	447 to 461	
14-15	Causes of spoilage, water activity for low and high moisture food	1			
16-17	Feed storage, existing grain storage methods, Requirements of good storage structures, bag storage structures; indigenous storage structures – Bukhari, Morai and Kothar; CAP, hermetic storage, Grain bins – cylindrical, rectangular and Pusa bin.	1	13.4 to 13.10	661 to 674	
18-19	Moisture and temperature changes in	1			25%

	grain bin, Shallow and deep bin, calculation of pressure in bins				
20	Farm Machinery storage structures	1	-	700 to 701	
21-22	Fencing types, farm gates, fencing post.	1	-	590-599	
23-25	Sources of water supply (in brief); Standard of quality of water and bacteriological standards; Water treatment process – impurities in water, objects of treatment, treatment process; Disinfection of rural water supplies.	3	3.7 to 3.10, 6.19 to 6.20, 11.1 to 11.4 and 18.6	46 to 54, 176 to 178, 290 to 293 and 437 to 442	

26-27	Rural sanitation – heads, latrines or privies; Septic tanks- domestic and municipal, design of septic tank.	3	25.1 to 25.3, 22.1 to 22.5	430 to 437 and 387 to 392	25%
28-29	Effects of thermal and gaseous environmental on livestock - Introduction, homoeothermy, energy balance and effects of temperature, humidity, air velocity and air contaminants.	4	-	121 to 156	
30-31	Quantity of air flow for livestock ventilation – fundamental equations, moisture balance, selection of values, and problems on minimum, medium and maximum ventilation rate.	4	-	169 to 190	

List of practicals:

- 1 Study of different instruments for measurement of environmental parameters.
- 2 Problems on quantity of air flow for livestock ventilation.
- 3 Planning and layout of dairy buildings.
- 4 Planning and layout of poultry buildings.
- 5 Planning and layout of sheep / goat house.
- 6 Design of farm fencing system.
- 7 Design of pit silo for fodder storage.
- 8 Design of trench silo for fodder storage.
- 9 Design of bag storage structure.
- 10 Planning and layout of implement shed.
- 11 Visit report on local dairy / poultry site.

List of Books:

1. Principles of Agricultural Engineering Volume-I, by T.P. Ojha and A.M. Michael, Jain Brothers, New Delhi-110005 (Fourth edition, 2003)

2. Agricultural Buildings and Structures, by James A. Lindley and James H. Whitakar, The Society for Engineering in Agricultural, Food and Biological Systems (ASAE), USA. Revised Edition of 1996.
3. Water Supply and Sanitary Engineering, by Gurucharan Singh, Standard Publishers Distributors, Delhi. (Fifth Edition, 1999).
4. Ventilation of Agricultural Structures, by Mylo A Hellickson and John N. Walker, An ASAE monograph number 6 in a series published by ASAE, USA (1983).

Reference Books:

1. Pandey, P.H. Principles and practices of Agricultural Structures and Environmental Control, Kalyani Publishers, Ludhiana.
2. Ojha, T.P and Michael, A.M. Principles of Agricultural Engineering, Vol. I, Jain Brothers, Karol Bag, New Delhi.
3. Nathanson, J.A. Basic Environmental Technology, Prentice Hall of India, New Delhi.
4. Venugopal Rao, P. Text Book of Environmental Engineering, Prentice Hall of India, New Delhi.
5. Garg, S.K. Water Supply Engineering, Khanna Publishers, New Delhi-6.
6. Dutta, B.N. Estimating and Costing in Civil Engineering, Duttta & CO, Lucknow.
7. Khanna, P.N. Indian Practical Civil Engineer's Hand Book, Engineer's Publishers, New Delhi.
8. Banerjee, G.C. A Text Book of Animal Husbandry, Oxford IBH Publishing Co, New Delhi.

Teaching Schedule

Lec. No.	Topics to be covered	Book No.	Article No.	Weightage, %
1	Greenhouse technology – historical background, global status of greenhouse, scope and importance.	1, 2, 3	General	25%
2-4	Constituents of greenhouse environment	1	3.1 to 3.6	
5-6	Classification of greenhouses	1	4.1 to 4.6	25%
7-10	Greenhouse construction	1	5.1 to 5.8	
11-12	Methods of greenhouse construction	2	3.3	
13-14	Greenhouse heating systems	1	6.1 to 6.3	25%
15-17	Greenhouse cooling systems	1	6.5 to 6.12	
18-20	Steady state analysis of a greenhouse	2	8.1 to 8.4	25%
21-22	Root media	1	7.1 to 7.6	
23-24	Root substrate pasteurization	3	-	
25-26	Instrumentation and automation for greenhouses	1	9.1 to 9.3	
27	Periodic maintenance of greenhouses	-	General	

Practical Exercises:

SN	Title
1.	Visit to commercial greenhouse complex / structure
2.	To measure greenhouse environmental parameters (temp., RH, Solar radiations, CO ₂ , air velocity etc) and prepare profiles of these parameters.
3.	Problems on greenhouse light requirements
4.	Problems on CO ₂ enrichment.
5.	Problems on calculation of greenhouse heat requirements.
6.	Problems on design of fan pad system.

7.	Problems on design of winter cooling system.
8.	Problems on greenhouse root media.
9.	Problems on greenhouse steady state analysis.
10.	Structural design of simple rectangular gable type GI pipe greenhouse structure (i.e. To find sizes of purlins, rafters and columns for desired wind speed pressure).

Suggested readings

Author	Year	Title	Publisher
Text Book			
Vilas M. Salokhe and Ajay K. Sharma	2006	Greenhouse Technology and Applications	Agrotech publishing academy Udaipur (Raj.)
G. N. Tiwari	2003	Greenhouse technology for controlled environment	Narosa publishing house, New Delhi / Mumbai
Paul V. Nelson	1998	Greenhouse operation and management	Prentice Hall, New Jersey – 07458
Reference Books			
Singh Brahma and Balraj Singh	2014	Advances in protected cultivation	New India Publishing Company, New Delhi
Sharma P.	2007	Precision Farming	Daya Publishing House New Delhi