Dept. of FS -

Course Code	Course Title	Credit	Semester
FS 121	Engineering Mechanics	3(2+1)	II (OLD)
FS-242	Building Materials	2(1+1)	IV (OLD)
FS-353	Strength of Material	3(2+1)	V (OLD)
FS 354	Agricultural Structures & Environmental Control	3(2+1)	V (OLD)
FS-365	Design of Structures	3(2+1)	VII (OLD)
CAF FS 471	Design and Maintenance of Greenhouse	3(2+1)	VII (OLD)

FS Dept.Old Syllabus –

LESSON PLAN FOR COURSE NO FS 121

Course No	: FS 121	Credits	: 3 (2+1)
Course Title	: Engineering Mechanics	Semester	: II

Syllabus

Theory:

Basic concepts. Force systems. Centroid. Moment of inertia. Free body diagram and equilibrium of force. 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 force, 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- coplanar force system, non concurrent – coplanar force system, non concurrent – non coplaner force system, parallel – non coplaner force 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 – coplanar and non concurrent – coplanar 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 too stresses in beams; Problems on torsion of shafts; Analysis of plane and complex stresses.

Recommended Text Books

No.	Author	Title & Year	Publisher
1	R.S. Khurmi	A text book of Engineering Mechanics,	S. Chand and company ltd., Ramnagar, New Delhi. First Multicolour Illustrative Revised Edition 2006, Reprint 2008.

Lesson Plan

Lect. No.	Topic	Book No.	Article No.	Page No.
1-2	Introduction	1	1.1 to 1.25	1-12
2-4	Composition and Resolution of Forces	1	2.1 to 2.17	13-23
7-8	Parallel forces and Couples	1	4.1 to 4.6 and 4.8 to 4.14	43-46 and 49-53
9-10	Equilibrium of forces	1	5.1 to 5.10	55-74
11-13	Centre of gravity	1	6.1 to 6.11	78-93
14-16	Moment of Inertia	1	7.1 to 7.16	100 to 120
17-18	Friction	1	8.1 to 8.10	124 to 127

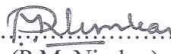| 19-20	Principles of lifting machines	1	10.1 to 10.18	171 to 182
21-22	Simple lifting machines – simple wheel and axle, differential wheel and axle, worm and worm wheel	1	11.1 to 11.5	185 to ---
23-27	Support reactions	1	12.1 to 12.23	217 to 242
29-30	Analysis of perfect frames – Analytical and Graphical method.	1	13.1 to 13.14	244 to 250 and 289 to 294

List of practicals

1. Determination of resultant force using graphically and determination of resultant of parallel forces graphically.
2. verification of Lami's theorem
3. Verification of the law of Triangle of forces.
4. Verification of the law of Parallelogram of forces.
5. Verification of the law of Polygon of forces.
6. Determination of center of gravity of given shapes.
7. Determination of coefficient of friction and angle of friction.
8. Determination of M. A., V. R. and efficiency of simple wheel and axle.
9. Determination of M. A., V. R. and efficiency of differential wheel and axle.
10. Determination of M. A., V. R. and efficiency of single purchase crab winch.
11. Determination of M. A., V. R. and efficiency of double purchase crab winch.
12. Determination of M. A., V. R. and efficiency of worm and worm wheel.
13. Determination of M. A., V. R. and efficiency of simple screw jack.

Place: Akola
Date: 22.9.11

(S. D. Vikhe)
Asst. Prof. (Civil.Engg.)
Dept. of FS, CAE, Parbhani

(A. A. Atre)
Head, Dept. of FSRE
Dr. ASCAE, Rahuri.

(P.M. Nimkar)
Head, Dept. of FS, &
Associate Dean, CAET, Akola

(N. J. Thakor)
Course Coordinator & Professor & Head,
Dept. of APE, CAET, Dapoli.

LESSON PLAN FOR COURSE NO FS-242

Course No. : FS-242   **Title Building Materials**
Sem : IV   **Credit : 2(1+1)**

Theory :

Stones : Properties of stones, Classification quarrying of stones.

Bricks : Constituents, winning, molding, drying and burning of bricks, types of bricks, properties of bricks.

Cement : Composition of ordinary cement, functions of cement ingredients, harmuful constituents of cement, settling action of cement, field and laboratory tests, storage, uses various types of cements.

Mortars : Types of mortars and mortar mill.

Concrete : Types, properties of concrete, aggregate, water cement ration, Measurement of material properties of concrete workability, consolidation and curing.

Tiles : Types, tile making process, properties of tiles.

Timber : Classification , structures, defects, qualities, decay preservation, seasoning, conversion and market forms, plywood and other timber substitutes.

Rubber and Plastics: Properties and applications, Thermal insulation and packaging materials.

Practicals :

Study of different types of rocks. Study of water absorption of stone and brick materials. Determination of soundness of cement by Le-chatelier apparatus. Test of adhesiveness of mortar to building units. To determine standard consistency of cement. To determine initial settling time of cement. To test workability of concrete by a) Slump cone method b) Compaction factor method. Bulking of sand test. Water absorption test of stones and bricks. Study of market forms of timber.

Recommended Text Books

No.	Author	Title & Year	Publisher
1.	S.C. Rangwala	Engineering Materials, (Twenty fifth Edition, 1999)	Charotar Publishing House, Opposite Amul Dairy, Court Road, Anand-388 001.

Lesson Plan

Lect. No.	Topic	Book No.	Chapter No.	Page No.
1-2	**Stones:** Classification of rocks, uses, natural bed of stones, qualities of good building stone, quarrying of stones- definition, site, methods.	1	I	2-23
3-4	**Bricks:** Constituents, winning, molding, drying, and burning of bricks, types of bricks, properties of bricks.	1	III	68-93
5-7	**Cement:** Composition of ordinary cement, functions of cement ingredients, harmful constituents of cement, setting action of cement, field and laboratory tests, storage, uses, various types of cements.	1	V	132-135, 147-162
8	**Mortars:** Functions of sand in mortar, Types of mortar, preparation of mortar, uses of mortar.	1	VI	168-177
9-11	**Concrete:** Types, properties of concrete, aggregate, water cement ratio, Estimating yield of concrete, properties of concrete, workability, Consolidation- hand consolidation, vibrators ; Curing- meaning, purpose of curing, period, effects of improper curing, methods of curing.	1	VII	183-210
12	**Tiles:** Types, manufacturing of tiles, properties of tiles.	1	II	47-54
13-14	**Timber:** Classification, structures, defects, qualities, decay, Preservation- requirements of a good preservatives, methods adopted for preservation; uses, seasoning - meaning and methods, conversion and market forms, plywood -introduction.	1	VIII	228-268
15-16	**Rubber and Plastics:** Rubber- types of rubber, process of obtaining natural rubber, vulcanization, properties and uses. Plastics – Polymerization, classification, properties and applications.	1	XVI and XV	476-482, 418-422, 432-436.

List of practicals:

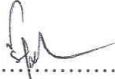1. Study of different types of rocks.

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2. Study of water absorption of stone and brick materials
3. Determination of soundness of cement by Lechatelier apparatus.
4. Determination of fineness of cement.
5. Test of adhesiveness of mortar to building units.
6. Determination of standard consistency of cement.
7. Determination of 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. Determination of void ratio and bulk density of cement.
12. Determination of void ratio and bulk density of fine aggregate and course aggregate.
13. Study of market forms of timber.
14. Visit to a construction site and to brick kiln / cement factory/ stone quarry / other building material.
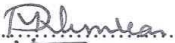
Reference Books:

1. Engineering Materials, by M.C. Choudhary, Niraj Prakshan, New Delhi.
2. A text book of Engineering Materials by G.J. Kulkarni. Pub. Kirit Ambala Patl, Ahemednagar.
3. A text book of Engineering Materials by Roy Choudhary, Oxford and IBH Publication Co., Calcutta 1984.
4. Engineering Materials by S.K. Bahal, Nand Charotter Book Stall, 1969.

Place: Akola
Date: 22.9.11

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Course No. : FS-353   **Title: Strength of Materials**

Sem :   V   **Credit: 3 (2+1)**

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.

Practicals:

        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.

Lesson Plan

Teaching Schedule

Lect. No.	Topic	Book No.	Article No.	Page No.
1-2	Thermal stresses and strains (Problem no. 5.2,5.5,5.6 and 5.9 only)	1	5.1 to 5.5	67 to 77
3-5	Elastic constants (Problem no. 6.2,6.5,6.6,6.10 and 6.11 only)	1	6.1 to 6.13	86 to 100
6-7	Strain energy and impact loading (problem no. 8.1,8.2,8.4	1	8.1 to 8.8 and 8.10	143 to 148 and 154 to 155

	& 8.11 only)			
8-10	Bending moment and shear force (problem no. 13.1 to 13.3,13.6,13.7 & 13.10)	1	13.1 to 13.9 and 13.11 to 13.12	270 to 276, 279 to 283 and 286 to 287
11-13	Bending stresses in simple beams (problem no. 14.1,14.4,14.5 and 14.9)	1	14.1 to 14.14	327 to 339
14-15	Direct and bending stresses (problem no. 17.1 and 17.3 only)	1	17.1 to 17.4 and 17.7	385 to 389 and 398 to 400
16-17	Deflection of beam (problem no. 19.1 and 19.2)	1	19.1 and 19.3 to 19.6	441 to 446
18	Deflection of cantilevers (problems 20.1 and 20.2)	1	20.1 to 20.4	466 to 468
19-21	Riveted joints (problem no 29.1 to 29.4 and 29.6 to 29.8 only)	1	29.1 to 29.25	664 to 680
22-25	Welded joints (problem no 30.1 to 30.7)	1	30.1 to 30.9	691 to 701
26-28	Columns and struts (problem no 32.1 and 32.4)	1	32.1 to 32.5, 32.8 and 32.9 and 32.11 to 32.13	723 -734

List of Practical: (Minimum ten of the following should be completed)

1. To perform tension test on mild steel specimen using UTM.
2. To determine crushing strength of concrete cube.
3. To determine flexural strength of timber.
4. To determine Young's Modulus of elasticity.
5. Problem/ Practical on determination of modules of rigidity using torsion test.
6. Determination of stiffness of helical spring.
7. To determine hardness of various metals.
8. To determine shear strength of mild steel bars using UTM.
9. Problems on shear force and bending moment.
10. Problems on simple bending stresses.
11. Problems on defection of beams.
12. Problems on strain energy and impact loading.
13. Problems on riveted joints.

14. Problems on welded joints.
15. Problems on thermal stresses and strains.

List of Text Books:

1. Strength of Materials (SI Units), by R.S. Khurmi, S. Chand and company ltd., Ramnagar, New Delhi. (Twenty Second Edition, 2002).

Reference books:

1. Elements of Strength of Materials, by Materials, by S. Timoshenko and D.H. Young, East-West press private limited, New Delhi.
2. Strength of Maaterials by Dr. S.Ramamrutham, Dhanpat Rai and Sons, New Delhi.

Course No. : FS-354 **Title:** Agricultural Structures & Environmental Control

Sem : V **Credit: 3(2+1)**

Theory:

Planning and layout of farmstead. Physiological reactions of livestock to solar radiation and other environmental factors, 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, silo, fencing and implement sheds. Design and construction of rural grain storage system and development of 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. Sewage system- its design, design of septic tank for small family. Scope, importance and need for environmental control for protected agriculture/ precision farming.

Practicals :

Instruments for measurements of environmental parameters. Cooling load of a farm building e.g.poultry house. Moisture condensation in agricultural buildings. Design and layout of a dairy farm. Design and layout of a poultry house. Design and layout of a sheep/goat house. Design of a biogas plant. Design of a farm fencing system. Design of ventilation system for dairy and poultry house. Design of a feed/fodder storage structures. Familiarization with local grain storage structures. Design of grain storage structures. Cost estimation of a farm buildings.

LESSON PLAN

Lect. No.	Topic	Book No.	Article No.	Page No.
1	Farmstead planning	2	-	417 to 427
2	Planning of farm residence and improved farm house design.	1	-	571 to 576
3-4	Dairy bam-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 to623
7-8	Poultry housing requirements; housing for laying hens; poultry management system-	2	-	565 to 579

	feeders, waters, egg collection, egg handling, egg cooling room and manure handling systems.			
9	Housing for pullet rearing and boiler production, site selection and building design, lighting and miscellaneous features.	2	-	579 to 584
10	Sheeping housing	1	-	627 to 630
11-12	Hay, grain and silage storage.	2	-	447 to 461
13-14	Feed storage, existing grain storage methods, requirements of good storage structures, bag storage structures; indigenous storage structures-Bukhari, Morai and Kothar; Grain bins- Cylindrical, rectangular and Pusa bin.	1	13.4 to 13.10	661 to 674
15	Farm Machinery storage structures	1	-	700 to 701
16	Types of fences, woven wire fence construction, barbed wire fence construction, electric fence installation.	2	-	440 to 445
17-19	Source of water supply (in brief); Standard of quality of water and bacterlogical 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
20-21	Rural sanitation-heads, latrines or privles; Septic tanks-domestic and and municipal, design of septic tank.	3		430 to 437 and 387 to 392
22-24	Effects of thermal and gaseous environmental on livestock- Introduction, homoeothermic, energy balance and effects of temperature, humidity, air velocity and air contaminants.	4		121 to 156
25-26	Ventilation systems for livestock structures.	4		195 to 212

27-28	Head and moisture control in buildings-Insulation, deciding quantity of insulation, selection of material, forms of insulation, insulation R. value; Moisture control-condensation, moisture transmission, vapor raterdants, predicting condensation.	2		288 to 293 and 301 to 313

List of practicals:

Prac. No.	Name of Practical	Book No.	Article/ Topic No.	Page No.
1	Study of different instruments for measurement of environmental parameters			
2	Design of ventilation system for diary house (only problem)	4	Chapt. No.8	169-191
3	Design of ventilation system for poultry house. (only problems)	4	Chapt. No.8	169-191
4	Calculation of cooling and heating load of farm buildings.	2	Chapt. No.15	315-345
5	Problems on moisture condensation in agricultural buildings.	2	Chapt. No.14	285-314
6	Design and layout of dairy barn	1		
7	Design and layout of poultry house	1		
8	Design and layout of sheep/goat house	1 or 2	Chapt. No.25	523-528
9	Design of farm fencing system (Problems)	1		

10	Design of pit silo for fodder storage (Problem)	1		
11	Design of trench silo for fodder storage (Problem)	1		
12	Design of grain storage structures/bag storage structure (Problem)	1 or 5	Chapt. No.4	

List of Books:

1. Principals of Agricultural Engineering Volume-1, 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).
5. Unit Operations of Agricultural Processing, by K.M. Sahay and K.K. Singh, Vikas Publishing House Pvt. Ltd., New Delhi (Second Revised Edition).

Course No. : FS-365, Title: Design of Structures

Sem :   VI   **Credit: 3 (2+1)**

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.

Practicals: Design and drawing of steel roof truss; Design and drawing of RCC building; Design and drawing of Retaining wall.

Department of Farm Structures

LESSON PLAN

Course Title : Design of Structures					
Course No.	:	FS-365	Semester	:	VI (Sixth)
Credit	:	3=2+1	Course	:	B. Tech. (Agril. Engg.)

Lect.No.	Topic	BOOK No.	Article No.	Page No.
	Part-1-Steel Structures			
1	Introduction	1	1.1to1.3	1to3
2to4	Tension members (problem no 4.1,4.3,and 4.5to4.8 only)	1	4.1to4.4	54to71
5to7	Compression member (problem no 5.2,5.4,5.7and5.8 only)	1	5.1to5.7	77to92

8to11	Industrial sheds (problem no 9.2,9.3,9.4,9.6and9.8 only)	1	9.1to9.2	201to223
	Part-2-RCC Structures			
12to13	Introduction Characteristic load, partial safety factors for load &material.	2	-	1to11and 20to23
14to15	Properties of concrete, proportioning and quality control of concrete	2	-	28to49
16to17	Design for flexure:Working stress method modular ratio, derivation of formulae for balanced design, problem on calculation of constants only.	3	5.1to5.4	119to128
18to19	Analysis & design of singly (LSM) reinforced sections	2	-	50to65
20to21	Analysis & design of of doubly reinforced sections	2	-	71to88
22to23	Shear, bond, development length (only theory); introduction to flanged section (T-beam) (only theory)	2	-	115to149 And 89to92
24to27	Design of one way slab (only theory),Design of two way slab	2	-	233to253 and253to 266
28to29	Design of axially loaded short columns	2	-	355to374
30to31	Types of footing, design of Isolated RCC footing	2	-	419to440

List of practicals : (full size drawing sheet)and Assignments.

Pract.No-   Name of Practical

1   Types of trusses and their components.
2   Design and drawing of roof trusses (two sheets).
3   Simple beam end connections.
4   Types of rolled steel sections.
5   Design and drawing of tension and compression members.
6   Simple design and drawing of RCC buildings – all components (two sheets)

List of Text Books

1) Design of steel structures by L.S.Negi, second edition, Tata Mcgraw – hill, New Delhi.
2) Lllusrated Reinforced concrete Design by Dr. V.L. Shah & Dr. S. R. Karve, First Edition, Structures publishers, Pune.
3) Reinforced concrete VOL. 1 (Elementary Reinforced Concrete) by Dr.H.J.Shah (Sixth revised and enlargrd edition,2005). Charotar publishing house, Opposite Amul Dairy, Court Road, Anand -388001, Gujrat, India.

List of Reference Books :

4) Limit state theory and design of reinforced concrete by Dr.V.L.Saha &Dr.S.R.Karve, Structures publishers, pune.
5) Reinforced concrete design (IS 456-2000) Principles and practice by N.Krishan Raju and R.N.Pranesh, New Age International
6) Fundametals of reinforced concrete by N.C.Sinha and S.K. Roy,S. chand & company.
7) Design of steel structure by S.K. Duggal, Tata Mcgraw-hill, New Delhi.
8) Design of steel structure by M.Raghupati, Tata Mcgraw-hill, New Delhi.
9) Design of steel structure by Ramchandra, Dhanpatrai and sons Publication company,New Delhi
10)RCC design by Sushil kumar, Standard book house,New Delhi.

Course Title : Design and Maintenance of Greenhouse

Course No.   : CAF- FS - 471   Semester : VIIth (New)

Credit   : 3 = 2+1   Course   : B.Tech. (Agril. Engg.)

Lec. No.	Topics to be covered	Book No.	Article No.	Page No.
1	Greenhouse technology – historical background, global status of greenhouse, scope and importance.	1, 2, 3	General	-
2-4	Constituents of greenhouse environment	1	3.1 to 3.6	28 to 51
5-6	Classification of greenhouses (in brief)	1	4.1 to 4.6	53 to 86
7-10	Greenhouse construction	1	5.1 to 5.8	87 to 112
11-12	Methods of greenhouse construction	2	3.3	85 to 94
13-14	Greenhouse heating systems	1	6.1 to 6.3	113 to122
15-17	Greenhouse cooling systems	1	6.5 to 6.12	130 to 145
18-20	Steady state analysis of a greenhouse	2	8.1 to 8.4	262 to 283
21-22	Root media	1	7.1 to 7.6	146 to 164
23-24	Root substrate pasteurization	3	-	225 to 243
25-26	Instrumentation and automation for greenhouses	1	9.1 to 9.3	188 to210
27	Periodic maintenance of greenhouses	-	General	-

List of practicals:				
Prac. No.	Title of practical	Book No.	Article No.	Page No.
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	1	3.2	34 to 36
4.	Problems on CO_2 enrichment.	1	3.3	39 to 45
5.	Problems on calculation of greenhouse heat	3	-	81 to131

	requirements.			
6.	Problems on design of fan pad system.	1	6.10	137-140
7.	Problems on design of winter cooling system.	3	-	139 to 165
8.	Problems on greenhouse root media.	1	7.5	161 to 163
9.	Problems on greenhouse steady state analysis.	2	8.1 to 8.4	262 to 283
10.	Structural design of simple rectangular gable type GI pipe greenhouse structure (i.e. To find sizes of purlins, rafters and coloumns for desired wind speed pressure).	Topic to be covered from structural design book / using civil engineering design software.		

TEXT BOOKS:

1. Greenhouse technolgy and applications, by Vilas M. Salokhe and Ajay K. Sharma. Agrotech publishing academy Udaipur (Raj.), First Edition (2006). Phone No. 0294-2465635 Mobile- 9414169635

2. Greenhouse technology for controlled environment, by G. N. Tiwari. Narosa publishing house, New Delhi / Mumbai. (2003 Edition).

3. Greenhouse operation and management, by Paul V. Nelson. Pentice Hall, New Jersey – 07458 (Fifth Edition 1998).