



Course Content

Course Code: 18EMDC702	Course Title: Mechanics of Solids	
L-T-P: 3-1-0	Credits: 4	Contact Hrs: 5
ESA Marks: 50	ISA Marks: 50	Total Marks: 100
Teaching Hrs: 40		Exam Duration: 3 hrs

Content	Hrs
Chapter No. 1. Introduction to stress Definition and Notation for forces, stresses and strains. Components of stresses, equations of Equilibrium, Specification of stress at a point. Principal stresses and shear stresses and Mohr's diagram in three dimensions. Boundary conditions. Stress transformation, Stress components on an arbitrary plane, Stress invariants, Octahedral stresses, Decomposition of state of stress.	6hrs
Chapter No. 2. Introduction to Strain Deformation, Strain Displacement relations, Strain components, The state of strain at a point, Principal strain, Compatibility equations.	5hrs
Chapter No. 3. Stress-Strain Relations and the General Equations of Elasticity Generalized Hooke's law in terms of engineering constants. Formulation of elasticity Problems. Existence and uniqueness of solution, Saint -Venant's principle, Principle of super position and reciprocal theorem.	5hrs
Chapter No. 4. Two Dimensional Problems in Cartesian Co-ordinates Airys stress function, investigation for simple beam problems. Bending of a narrow cantilever beam under end load, simply supported beam with uniform load, Use of Fourier series to solve two dimensional problems.	6hrs
Chapter No. 5. Two Dimensional Problems in Polar Co-ordinates General equations, stress distribution symmetrical about an axis, Strain components in polar co-ordinates, Rotating disk and cylinder, Stress concentration around a circular hole in an infinite Plate.	6hrs
Chapter No. 6. Torsion Torsion of circular bar, Torsion of elliptical bar, Membrane analogy, Torsion of thin tubes.	4 hrs
Chapter No. 7. Yield criteria for ductile metal Von Mises, Tresca, Yield surface for an Isotropic Plastic materials, Stress space and Experimental verification of Yield criteria, Yield criteria for an anisotropic material.	4hrs
Chapter No. 8. Deformation of metals and Foundation of plasticity Crystalline structure of metals, Mechanism of plastic deformation, factors affecting the plastic deformation, Assumptions of Plasticity Theory, bilinear stress-strain relationship, strain hardening, flow rule, flow rule normality conditions, hardening rule.	4hrs

Text Book

1. L S Srinath, **Advanced Mechanics of Solids**, 3rd Edition, Tata Mcgraw Hill Company, 2009.
2. T.G.Sitharam, **Applied Elasticity**, Interline publishing, 2004.
3. Dr. Sadhu Singh, **Theory of Plasticity and Metal forming Process**, 3rd Edition, Khanna Publishers, 2011.
4. J. Chakraborty, **Theory of Plasticity**, second, Mc Graw Hill, 2006.

Course Feedback

(To be filled by each Student at the time of Course Completion)

Dear Students,

Please give us your views on this Course so that the course quality can be improved. You are encouraged to be frank and constructive in your comments.

Course Teacher gav

Department/School Machine Design Name of the Teacher Dr. G. U. Raju
 Course Title Mechanics of Solids Course code: 18EMDC302 Semester 1

a. The design of the course	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
The course objectives were clear	<input checked="" type="checkbox"/>				
The course contents met with your expectation	<input checked="" type="checkbox"/>				
The course work load was manageable		<input checked="" type="checkbox"/>			
The lecture sequence was well planned to meet learning outcomes		<input checked="" type="checkbox"/>			
The contents were illustrated with adequate examples		<input checked="" type="checkbox"/>			
The course exposed you to new knowledge and practice		<input checked="" type="checkbox"/>			
The level of the course was moderate		<input checked="" type="checkbox"/>			

b. The conduct of the course	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
The lectures were easy to understand & ideas and concepts presented clearly	<input checked="" type="checkbox"/>				
The teaching aids were effectively used	<input checked="" type="checkbox"/>				
The course material handed out was adequate	<input checked="" type="checkbox"/>				
Were objectives of the course realized?		<input checked="" type="checkbox"/>			
The overall environment in the class was conducive to learning		<input checked="" type="checkbox"/>			

c. Learning Resources	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
Learning materials (Lesson Plans, Course Notes etc.) were relevant and useful	<input checked="" type="checkbox"/>				
Recommended reading Books etc. were relevant and appropriate	<input checked="" type="checkbox"/>				
The provision of learning resources in the library was adequate and appropriate		<input checked="" type="checkbox"/>			

d. Assessment	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
The method of assessment were reasonable		<input checked="" type="checkbox"/>			
Feedback on ISA assessment was timely		<input checked="" type="checkbox"/>			
Feedback on ISA assessment was helpful		<input checked="" type="checkbox"/>			

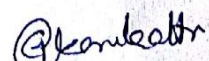
Suggestions for improvement:

As subject is more numerical based, extra hours required to solve problems.

Overall rating of the course: (✓ tick mark the appropriate)

90% - 100% ☒ 90% 70% - 80% ☐ 60% - 70% ☐ 50% - ☐ Below 50% ☐

Date: 28 / 01 / 2019


 Signature



Course Feedback

(To be filled by each Student at the time of Course Completion)

Dear Students,

Please give us your views on this Course so that the course quality can be improved. You are encouraged to be frank and constructive in your comments.

Course Teacher *[Signature]*

Department/School Machine Design Name of the Teacher E.V. Raju

Course Title Mechanics of Solids Course code: 18EMD Semester 01
C702

a. The design of the course	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
The course objectives were clear		✓			
The course contents met with your expectation		✓			
The course work load was manageable		✓			
The lecture sequence was well planned to meet learning outcomes		✓			
The contents were illustrated with adequate examples		✓			
The course exposed you to new knowledge and practice		✓			
The level of the course was moderate	✓				

b. The conduct of the course	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
The lectures were easy to understand & ideas and concepts presented clearly		✓			
The teaching aids were effectively used	✓				
The course material handed out was adequate		✓			
Were objectives of the course realized?		✓			
The overall environment in the class was conducive to learning	✓				

c. Learning Resources	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
Learning materials (Lesson Plans, Course Notes etc.) were relevant and useful		✓			
Recommended reading Books etc. were relevant and appropriate		✓			
The provision of learning resources in the library was adequate and appropriate	✓				

d. Assessment	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
The method of assessment were reasonable	✓				
Feedback on ISA assessment was timely		✓			
Feedback on ISA assessment was helpful	✓				

Suggestions for improvement:

More time is required to solve problems on Cartesian & Polar coordinates.

Overall rating of the course: (✓ tick mark the appropriate)

90% - 100% ☒ 90% - 80% ☐ 70% - 50% ☐ Below 50% ☐

Date 29/11/2019

[Signature]
Signature

(Navendra Padil)



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Course Feedback

(To be filled by each Student at the time of Course Completion)

Dear Students,

Please give us your views on this Course so that the course quality can be improved. You are encouraged to be frank and constructive in your comments.

Course Teacher Dr. G. V. Ragu

Department/School Machine Design Name of the Teacher Dr. G. V. Ragu
Course Title Mechanics of Solids Course code: 18CMT002 Semester 2

a. The design of the course	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
The course objectives were clear	<input checked="" type="checkbox"/>				
The course contents met with your expectation	<input checked="" type="checkbox"/>				
The course work load was manageable	<input checked="" type="checkbox"/>				
The lecture sequence was well planned to meet learning outcomes		<input checked="" type="checkbox"/>			
The contents were illustrated with adequate examples		<input checked="" type="checkbox"/>			
The course exposed you to new knowledge and practice		<input checked="" type="checkbox"/>			
The level of the course was moderate			<input checked="" type="checkbox"/>		

b. The conduct of the course	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
The lectures were easy to understand & ideas and concepts presented clearly		<input checked="" type="checkbox"/>			
The teaching aids were effectively used		<input checked="" type="checkbox"/>			
The course material handed out was adequate		<input checked="" type="checkbox"/>			
Were objectives of the course realized?	<input checked="" type="checkbox"/>				
The overall environment in the class was conducive to learning	<input checked="" type="checkbox"/>				

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Recommended reading Books etc. were relevant and appropriate		<input checked="" type="checkbox"/>			
The provision of learning resources in the library was adequate and appropriate	<input checked="" type="checkbox"/>				

d. Assessment	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
The method of assessment were reasonable		<input checked="" type="checkbox"/>			
Feedback on ISA assessment was timely	<input checked="" type="checkbox"/>				
Feedback on ISA assessment was helpful	<input checked="" type="checkbox"/>				

Suggestions for improvement:

Overall rating of the course: (tick mark the appropriate)

90% - 100% ☒ 90% - 70% ☐ 70% - 50% ☐ Below 50% ☐

Date: 28/01/2019

Deepanjali
Signature

Course Feedback

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Dear Students,

Please give us your views on this Course so that the course quality can be improved. You are encouraged to be frank and constructive in your comments.

Course Teacher *[Signature]*

Department/School Machine Design Name of the Teacher Dr. B. V. Raju

Course Title Mechanics of Solids Course code: _____ Semester I
18EMD202

a. The design of the course	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
The course objectives were clear		✓			
The course contents met with your expectation	✓				
The course work load was manageable		✓			
The lecture sequence was well planned to meet learning outcomes		✓			
The contents were illustrated with adequate examples		✓			
The course exposed you to new knowledge and practice		✓			
The level of the course was moderate		✓			

b. The conduct of the course	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
The lectures were easy to understand & ideas and concepts presented clearly		✓			
The teaching aids were effectively used	✓				
The course material handed out was adequate		✓			
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The provision of learning resources in the library was adequate and appropriate	✓				

d. Assessment	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
The method of assessment were reasonable	✓				
Feedback on ISA assessment was timely		✓			
Feedback on ISA assessment was helpful	✓				

Suggestions for improvement:

more time consumed for solving cartesian problems & polar co-ordinate problems.

Overall rating of the course: (✓ tick mark the appropriate)

90% - 100% ☒ 90% - 80% ☐ 70% - 50% ☐ Below 50% ☐

Date: 28/1/2019

[Signature]
 Signature

(Shubam Godke)



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Course Feedback

(To be filled by each Student at the time of Course Completion)

Dear Students,

Please give us your views on this Course so that the course quality can be improved. You are encouraged to be frank and constructive in your comments.

Course Teacher *[Signature]*

Department/School SME, Machine Design Name of the Teacher Dr G. U. Raju

Course Title Mechanics of Solids Course code: 18EMDC702 Semester 2

a. The design of the course	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
The course objectives were clear		<input checked="" type="checkbox"/>			
The course contents met with your expectation		<input checked="" type="checkbox"/>			
The course work load was manageable		<input checked="" type="checkbox"/>			
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The method of assessment were reasonable		<input checked="" type="checkbox"/>			
Feedback on ISA assessment was timely		<input checked="" type="checkbox"/>			
Feedback on ISA assessment was helpful		<input checked="" type="checkbox"/>			

Suggestions for improvement:

Application related problems required to solve in the tutorials.

Overall rating of the course: (✓ tick mark the appropriate)

90% - 100% ☒ 90% - 70% ☐ 70% - 50% ☐ Below 50% ☐

Date: 29/01/2019

[Signature]
Signature
(H V Hemangi)

Dear proud alumni,

The following are the list of skills and competencies that engineering graduates should have. We seek your participation in the Alumni Survey conducted to know your satisfaction with the *level of competency* you have achieved as a result of your education at the Institution and also able to practice the same. For each question, indicate your opinion with a tick mark(✓) in the appropriate column. All individual responses will be kept confidential. Only statistically analyzed results from the entire population will be shared.

Regards,

Head, School of Mechanical Engineering

S.No	Competencies	Level of Competency			
		Completely Dissatisfied	Dissatisfied	Satisfied	Completely Satisfied
1	<u>Research skills :</u>				
	Review Design Engineering literature to gain insight into problem analysis, design/development of solutions and research gaps.			✓	
	Develop a solution using appropriate technique to address the identified problem.				✓
2	<u>Communication:</u>				
	Publish scholastic thought process through Thesis/ Technical article.				✓
	Articulate research findings emphasizing its real time utility to stakeholders.				✓
3	<u>Scholarship of knowledge:</u>				
	Develop alternate or new concepts to a problem through innovative application of domain knowledge.			✓	
	Apply principles of Design Engineering for complete investigations into operation, monitoring and control of a process, system or device.			✓	
4	<u>Use of Modern tools:</u>				
	Acquire competence in modern design computational tools for modeling, simulation and analysis of machine component or system.				✓
5	<u>Sustainable designs:</u>				
	Apply sustainability principles to evolve benign solutions that ensure highest standards in public health, safety, justice and cultural diversities.			✓	

Indicate your Answer with symbol "✓" in the appropriate box.

1) How would you rate your overall satisfaction with your preparation to become an engineer?

Not Satisfied ☐ Little Satisfied ☐ Satisfied ☐ Very Satisfied ☒

2) In general, the department has provided a _____ quality academic program?

Poor ☐ OK ☐ Good ☐ Very Good ☒

Name:		Branch: <i>Machine Design</i>	
e-mail id: <i>rakesh_kulkarni@gmail.com</i>		Mobile: <i>9980367123</i>	
Batch: <i>2017</i>			
Name of the company: <i>Start up.</i>			
Correspondence Address: <i>Start up in Pune.</i>			
Signature: <i>Rakesh</i>			



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Head, School of Mechanical Engineering

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		Completely Dissatisfied	Dissatisfied	Satisfied	Completely Satisfied
1	Research skills :				
	Review Design Engineering literature to gain insight into problem analysis, design/development of solutions and research gaps.			✓	
	Develop a solution using appropriate technique to address the identified problem.			✓	
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	Acquire competence in modern design computational tools for modeling, simulation and analysis of machine component or system.				✓
5	Sustainable designs:				
	Apply sustainability principles to evolve benign solutions that ensure highest standards in public health, safety, justice and cultural diversities.				✓



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Alumni Feedback 2019-20



Indicate your Answer with symbol "✓" in the appropriate box.

1) How would you rate your overall satisfaction with your preparation to become an engineer?

Not Satisfied ☐ Little Satisfied ☐ Satisfied ☒ Very Satisfied ☐

2) In general, the department has provided a _____ quality academic program?

Poor ☐ OK ☐ Good ☐ Very Good ☒

Name: Najamuddin Mulla		Branch: Mechanical Machine Design
e-mail id: najamm@gmail.com	Mobile: 8792793947	Batch: 2017
Name of the company: Maestrotech Systems Pvt Ltd.		
Correspondence Address: Maestrotech Systems Pvt Ltd Pune.		
Signature: Najamuddin Mulla.		



Dear proud alumni,

The following are the list of skills and competencies that engineering graduates should have. We seek your participation in the Alumni Survey conducted to know your satisfaction with the *level of competency* you have achieved as a result of your education at the Institution and also able to practice the same. For each question, indicate your opinion with a tick mark(✓) in the appropriate column. All individual responses will be kept confidential. Only statistically analyzed results from the entire population will be shared.

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KLE Technological University, Hubli
Alumni Feedback 2019-20



Indicate your Answer with symbol "✓" in the appropriate box.

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Not Satisfied ☐ Little Satisfied ☐ Satisfied ☒ Very Satisfied ☐

2) In general, the department has provided a _____ quality academic program?

Poor ☐ OK ☐ Good ☒ Very Good ☐

Name: <u>Danijel Negalar</u>	Branch: <u>Machine Design</u>
e-mail id: <u>01fe17immd004@kletech.ac.in.</u> Mobile: <u>8792349212</u>	Batch: <u>2017-19</u>
Name of the company: <u>Saiphia Technology Pvt. Ltd.</u>	
Correspondence Address: <u>New Industrial Area</u> <u>Satlapur, Raipur, M.P. state.</u>	
Signature: <u>[Signature]</u>	

Dear proud alumni,

The following are the list of skills and competencies that engineering graduates should have. We seek your participation in the Alumni Survey conducted to know your satisfaction with the *level of competency* you have achieved as a result of your education at the Institution and also able to practice the same. For each question, indicate your opinion with a tick mark(✓) in the appropriate column. All individual responses will be kept confidential. Only statistically analyzed results from the entire population will be shared.

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2) In general, the department has provided a _____ quality academic program?

Poor ☐ OK ☐ Good ☒ Very Good ☐

Name: Ankit S.		Branch: machine Design	
e-mail id: 01fel7mm2002@kletech.ac.in		Mobile: 9538838334	
Batch: 2017-19			
Name of the company: CIPD, Hubli.			
Correspondence Address: CIPD, KLETU, Vidyanagar, Hubli. Karnataka - 580031.			
Signature:			



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2) In general, the department has provided a _____ quality academic program?

Poor ☐ OK ☐ Good ☐ Very Good ☒

Name: <i>Iranna Javalagaddi</i>	Branch: <i>Machine Design</i>
e-mail id: <i>irannamj@gmail.com</i> Mobile: <i>9902145753</i>	Batch: <i>2017-</i>
Name of the company: <i>Axis codes</i>	
Correspondence Address: <i>Kirloskar Business Park Block 'C', 2nd Floor, Hebbal Bangalore - 560024</i>	
Signature: <i>Iranna J</i>	



Dear Sir,

We seek your kind participation in this process of collecting feedback about our graduates serving in your organization. Your inputs will be helping us to make required modifications in the existing curriculum, pedagogy to enhance the competencies of the graduating engineers. For each question, indicate your opinion with a tick mark (✓) in the appropriate column. All individual responses will be kept confidential. Only statistically analyzed results from the entire population will be shared.

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Employer Feedback 2019-20



Space for comments:

- Elaborate Second mechanics moments.
- Emphasize PEEQ
- Introduce thermal stresses, as ^{it contributes in} most of the bearing failures.

Name of the organization: ZKL Bearings

Address: C-402, Mangalaya, Moad - Maroshi road,
Andheri (E) - Mumbai - 400059.

Name of the contact person: Bipin Kulkarni

Designation: Marketing director

e-mail id: bipin@zklindia.com

Mobile: 9022 454113

Signature: Bipin Kulkarni

Dear Sir,

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	Publish scholastic thought process through Thesis/ Technical article.				✓
	Articulate research findings emphasizing its real time utility to stakeholders.				✓
3	<u>Scholarship of knowledge:</u>				
	Develop alternate or new concepts to a problem through innovative application of domain knowledge.			✓	
	Apply principles of Design Engineering for complete investigations into operation, monitoring and control of a process, system or device.				✓
4	<u>Use of Modern tools:</u>				
	Acquire competence in modern design computational tools for modeling, simulation and analysis of machine component or system.				✓
5	<u>Sustainable designs:</u>				
	Apply sustainability principles to evolve benign solutions that ensure highest standards in public health, safety, justice and cultural diversities.			✓	



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Employer Feedback 2019-20



Space for comments: Thermal stress analysis is a important content as these stresses leads to fracture / Plastic deformation depending on the heat load, and environmental changes. So it is suggested to incorporate study of Thermal stresses as introductory level.

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Curriculum Revision

Course: Mechanics of Solids Code: 18EMDC702

Course (if revised):

Course Instructor: G. U. Raju

Pass %: 100

Code (if revised):

2018-20		Inputs	2018-20	
Program Outcomes			Program Outcomes	
Mapping	Attainment		Mapping	
		Faculty Experiences (Course feedbacks/Student interactions/others):	yes	PO3 PO4
PO3		Industry Advises/inputs:	yes	
PO4		Placement Feedback:	Nil	
		Alumni Feedback:	yes	
		Student Feedback:	yes	
		Other inputs (specify):	Nil	

Innovations/Changes:

BOS approved

a. CO added		<input type="checkbox"/>
b. PO added		<input type="checkbox"/>
c. Content/topic added/refined	<i>Thermal stresses chapter is added, contents of plasticity chapter is revised</i>	<input checked="" type="checkbox"/>
d. Change in Delivery mode		<input type="checkbox"/>
e. Change in Assessment type		<input type="checkbox"/>
f. Any other, specify		<input type="checkbox"/>

G. U. Raju
 Faculty Signature

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Analysis and Action Taken Report Approved in Board of Studies dated 13-04-2019 and implemented with effect from 2019-2020

Observations/ Analysis based on feedback of Students/Alumni and Employers

1. Students are satisfied with design of the course, conduct of the course, learning research and assessment pattern.
2. Alumnus are satisfied with research skills, communication, knowledge of our PG students, however they suggested to use modern tools for stress and strain analysis.
3. Employers are satisfied with overall course competencies and suggested to introduce thermal stress analysis as it is important in operating condition failures.

Observations/ Recommendations based on feedback		POs impacted
Teachers Feedback (Pre-BoS MoM): V		PO3 and PO4
It was proposed to include thermal stresses chapter and revise plasticity contents in BOS meeting.		
Actions taken	Course Revised/ Added	BoS approved Date
Thermal stress module is introduced with focus on thermo elastic stress-strain relations of thin circular disk, long circular cylinder, and straight beams. The contents of plasticity are revised.	Mechanics of Solids (19EMDE702)	13-04-2019



HEAD
School of Mechanical Engineering
Technological University, HUBBALLI





Course Content

Course Code: 19EMDE702	Course Title: Mechanics of Solids	
L-T-P: 4-0-0	Credits: 4	Contact Hrs: 4
ESA Marks: 50	ISA Marks: 50	Total Marks: 100
Teaching Hrs: 50		Exam Duration: 3 hrs

Content	Hrs
Chapter No. 1. Analysis of stress Introduction, body force, surface force and stress vector, the state of stress at a point, rectangular stress components, stress components on an arbitrary plane, equality of cross shears, differential equations of equilibrium, principal stresses, Mohr's circles for the three-dimensional state of stress, octahedral stresses, decomposition into hydrostatic and pure shear states.	7hrs
Chapter No. 2. Analysis of Strain Introduction, deformation, strain displacement relations, state of strain at a point, strain tensors, cubical dilatation, principal strains, spherical and deviator strain tensors, octahedral strains, compatibility conditions.	7hrs
Chapter No. 3. Stress-Strain Relations for Linearly Elastic Solids Generalized Hooke's law, stress-strain relations for isotropic materials, transformation of compatibility condition from strain components to stress components, relations between the elastic constants, Saint Venant's principle and uniqueness theorem.	6hrs
Chapter No. 4. Two Dimensional Problems in Cartesian Co-ordinates Plane stress and plane strain problems, Airys stress function, solution of two-dimensional problems by the use of polynomials, pure bending of a beam, bending of a narrow cantilever beam under end load, simply supported beam subjected to point load and uniformly distributed load, use of Fourier series to solve two dimensional problems.	7hrs
Chapter No. 5. Two Dimensional Problems in Polar Co-ordinates General equations, biharmonic equation, stress distribution symmetrical about an axis, strain components in polar co-ordinates, thick-walled cylinders, rotating disks of uniform thickness, effect of circular holes on stress distribution in plates.	7hrs
Chapter No. 6. Torsion of Prismatic Bars Introduction, general solution of the torsion problem, torsion of circular, elliptical and equilateral triangular cross section bar, membrane analogy, torsion of thin tubes.	6hrs
Chapter No. 7. Thermal Stresses Introduction, thermoelastic stress-strain relations, thin circular disk; temperature symmetrical about centre, long circular cylinder, normal stresses in straight beams due to thermal loading.	5hrs
Chapter No. 8. Introduction to Plasticity Mechanism of plastic deformation, factors affecting plastic deformation, strain hardening, theories of plastic flow, Tresca and Von Mises yield criteria, discussion of plasticity conditions, experimental evidence for yield criteria.	5hrs

Text Book

5. L S Srinath, **Advanced Mechanics of Solids**, 3rd Edition, Tata Mcgraw Hill Company, 2009.
6. T.G.Sitharam, **Applied Elasticity**, Interline publishing, 2004.
7. Dr. Sadhu Singh, **Theory of Plasticity and Metal forming Process**, 3rd Edition, Khanna Publishers, 2011.
8. J. Chakraborty, **Theory of Plasticity**, second, Mc Graw Hill, 2006.