<table>
<tr><td>1.</td><td colspan="5">Name of Course</td><td>Strength of Materials</td></tr>
<tr><td>2.</td><td colspan="5">Course Code</td><td>JSTM1203</td></tr>
<tr><td></td><td colspan="6">JSTM = the first alphabet identify the faculty within which the subject is offered., JSTM = the remaining three alphabet identify the course that offers the subject, 1203 = the first digit identify level of study; in this case undergraduate level, 1203 = the second and third digits identify subject identity and 1203= the fourth digit identify credit value or credit hours</td></tr>
<tr><td>3.</td><td colspan="5">Name(s) of academic staff</td><td>To be Assigned</td></tr>
<tr><td>4.</td><td colspan="5">Rationale for the inclusion of the course/module in the programme</td><td>Fundamental subject for engineers</td></tr>
<tr><td>5.</td><td colspan="5">Semester and Year offered</td><td>2/1</td></tr>
<tr><td rowspan="3">6.</td><td colspan="2" rowspan="3">Total Student Learning Time (SLT)
L = Lecture T = Tutorial
P = Practical S=Studio Works
O= Others</td><td colspan="4">Face to Face</td><td rowspan="3">Total Guided and Independent Learning
Independent Study(IS)= 70
Total=126</td></tr>
<tr><td>L</td><td>T</td><td>P/S</td><td>O</td></tr>
<tr><td>28</td><td>14</td><td>14</td><td>-</td></tr>
<tr><td>7.</td><td colspan="5">Credit Value</td><td>3.0</td></tr>
<tr><td></td><td colspan="6">Lecture (1 hour per week x 14 weeks)
Tutorial (1 hour per week x 14 weeks)
Practical (2 hour fortnightly x 7 weeks)</td></tr>
<tr><td>8.</td><td colspan="5">Prerequisite (if any)</td><td>Applied Mechanics (JAPD1053)</td></tr>
<tr><td>9.</td><td colspan="6">Course Objectives
1. The objective of this course is to give understanding to students the theory and principle of material strength, stress and strain.

Course Learning Outcomes (CLO)
At the end of the semester students should be able to:

CLO1: Know and Understand fundamental principle of strength of material and analysis
CLO2: Know and Understand concept of stress strain and materials relations
CLO3: Know and Understand torsion, strength in beam, combine and inelastic behavior of materials</td></tr>
<tr><td>10.</td><td colspan="6">Transferable Skills:
This course is expected the development of the following transferable skills:
a) Self-management – an ability to manage time and task
b) Learning skills
▪ An ability to learn both independently and co—operatively;
▪ An ability to use library skills, to find and organize information ;
▪ An ability to use a wide range of academic skills (research, analysis, synthesis etc.);
▪ An ability to identify and evaluate personal learning strategies.
c) Teamwork
▪ An ability to take responsibility and carry out agreed task;
▪ An ability to take initiative and lead other;
▪ An ability to identify and evaluate personal learning strategy.
d) Problem solving
▪ An ability to analyse;
▪ An ability to think laterally about a problem;</td></tr>
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<tr><td></td><td>

An ability to identify strategy options;
An ability to solve the problems

e) Information technologies

An ability to use specialist software where relevant to the discipline.

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<tr><td>11.</td><td>
Teaching-learning and assessment strategy
A variety of leaching strategies are used throughout the course, including the following:

Classroom Lessons; Lecturer and power point presentations
Tutorial Session;
Student-Lecturer Discussion
Collaborative and Co-operative learn;
Independent study.

Assessment:
<table>
<tr><td>Course Work</td><td></td><td>40%</td></tr>
<tr><td>Assignment</td><td>5%</td><td></td></tr>
<tr><td>Tutorials /Quizzes</td><td>5%</td><td></td></tr>
<tr><td>Practical</td><td>10%</td><td></td></tr>
<tr><td>Test</td><td>20%</td><td></td></tr>
<tr><td>Examination</td><td></td><td>60%</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td><u>Total</u></td><td></td><td><u>100%</u></td></tr>
</table>
</td></tr>
<tr><td>12.</td><td>
Synopsis:

This course provide the students with knowledge of Moment of Areas, concept of stress, Strain and Material Relations, Analysis of stress and Strain, torsion, Stresses in Beams, Combine Stresses and Inelastic Behaviour
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<tr><td>13.</td><td>
Mode of Delivery:
Lectures;
Tutorial;
Practical.
</td></tr>
</table>

14.	**Performance Criteria :**						
	CLO-PLO	Assessment Tool	1	2	3	4	5
	Marks		0-39	40-49	50-59	60-74	75-100
	Grade		**(F)**	**(D,D+)**	**(C-,C,C+)**	**(B-,B,B+)**	**(A-,A,A+)**
	CLO1: Know and Understand fundamental principle of strength of material and analysis	**Assignment** **Tutorial** **Quizzes** **Practical** **Test** **Examination**	**Fail to:** • Learn both independent and cooperatively • Use library skills, to find and organize information • Manage time and task	**Poor to:** • Learn both independent and cooperatively • Use library skills, to find and organize information • Manage time and task	**Satisfactory to:** • Learn both independent and cooperatively • Use library skills, to find and organize information • Manage time and task	**Good to:** • Learn both independent and cooperatively • Use library skills, to find and organize information • Manage time and task	**Excellent to:** • To: Learn both independent and cooperatively • Use library skills, to find and organize information • Manage time and task
	CLO2: Know and Understand concept of stress strain and materials relations	**Assignment** **Tutorial** **Quizzes** **Practical**	**Fail to:** • Learn both independent and cooperatively • Use library	**Poor to:** • Learn both independent and cooperatively • Use library	**Satisfactory to:** • Learn both independent and cooperatively • Use library	**Good to:** • Learn both independent and cooperatively • Use library	**Excellent to:** • Learn both independent and cooperatively • Use library

		Test **Examination**	skills, to find and organize information • Manage time and task	skills, to find and organize information • Manage time and task	skills, to find and organize information • Manage time and task	skills, to find and organize information • Manage time and task	skills, to find and organize information • Manage time and task
	CLO3: Know and Understand torsion, strength in beam, combine and inelastic Behavior of materials	**Assignment** **Tutorial** **Quizzes** **Practical** **Test** **Examination**	**Fail to:** • Learn both independent and cooperatively • Use library skills, to find and organize information • Manage time and task	**Poor to:** • Learn both independent and cooperatively • Use library skills, to find and organize information • Manage time and task	**Satisfactory to:** • Learn both independent and cooperatively • Use library skills, to find and organize information • Manage time and task	**Good to:** • Learn both independent and cooperatively • Use library skills, to find and organize information • Manage time and task	**Excellent to:** • Learn both independent and cooperatively • Use library skills, to find and organize information • Manage time and task

15. **Mapping of the Programme Objectives to the Programme Learning Outcomes**

Programme Objectives (PO) \ Programme Learning Outcomes (PLO)	**PLO1:** Ability to acquire and apply knowledge of science and engineering fundamentals;	**PLO2:** Acquired in-depth technical competence in civil engineering discipline;	**PLO3:** Ability to undertake problem identification, formulation and solution;	**PLO4:** Ability to utilize systems approach to design and evaluate operational performance;	**PLO5:** Understanding of the principles of design for sustainable development;	**PLO6:** Understanding of professional ethics, Islamic values, social, cultural, global and environmental responsibilities of a professional engineer and commitment to them;	**PLO7:** Ability to communicate effectively, not only with engineers but also with the community at large;	**PLO8:** ability to function effectively as an individual;	**PLO9:** Ability to function effectively in group with the capacity to be a leader or manager;	**PLO10:** Recognizing the need to undertake lifelong learning, and possessing /acquiring the capacity to do so;	**PLO11**: ability to become Entrepreneur;
PEO1: To produce graduates with proficient knowledge and competency in various areas in Civil/ Electrical/ Mechanical Engineering	✓	✓	✓								
PEO2: To produce graduates with professional, generic attributes to meet the present and future global demands.				✓	✓	✓			✓	✓	
PEO3: To produce graduates with Islamic humanistic values and reinvention skills to meet the requirement of a dynamic environment. These skills include Civil Intelligence, Moral Intelligence, Self-Reliance							✓	✓	✓		✓

	and Communication Skills											

16. **Mapping of the course Learning Outcome to the Programme Outcome**

Programme Learning Outcomes (PLO) / Course Learning Outcome (CLO)	PLO1: Ability to acquire and apply knowledge of science and engineering fundamentals;	PLO2: Acquired in-depth technical competence in civil engineering discipline;	PLO3: Ability to undertake problem identification, formulation and solution;	PLO4: Ability to utilize systems approach to design and evaluate operational performance;	PLO5: Understanding of the principles of design for sustainable development;	PLO6: Understanding of professional ethics, Islamic values, social, cultural, global and environmental responsibilities of a professional engineer and commitment to them;	PLO7: Ability to communicate effectively, not only with engineers but also with the community at large;	PLO8: ability to function effectively as an individual;	PLO9: Ability to function effectively in group with the capacity to be a leader or manager;	PLO10: Recognizing the need to undertake lifelong learning, and possessing /acquiring the capacity to do so;	PLO11: ability to become Entrepreneur;
CLO1: Know and Understand fundamental principle of strength of material and analysis	✓										
CLO2: Know and Understand concept of stress strain and materials relations	✓										
CLO3: Know and Understand torsion, strength in beam, combine and inelastic behavior of materials	✓	✓	✓								

17.	Content outline of the course/module and the SLT per topic						
		Details	**SLT (Hour)**				
			L	**T**	**P**	**IS**	**Total**
	Topic 1	**Fundamental Principles** • Introduction • Scope of treatment • Method of analysis • Force and Load Classifications • Condition for Static Equilibrium • Analysis of Internal Forces: Method of Sections • Components of Internal-Force for Supports • Conventional Diagrams foe Supports • Rational Design Procedure	2	1	-	7	**10**
	Topic 2	**Moment of Areas** • First Moments of an area: Centroid • Moments of Inertia • Parallel-Axis Theorem • Principal Moments of Inertia • Problems	2	1	-	7	**10**
	Topic 3	**Concept of stress** • Introduction • Stress Defined • Components of Stress • Internal Axial Forces • Normal Stress • Average Shearing Stress • Application to Simple Structures • Application to Thin-Walled Pressure Vessels • Allowable Stress: Factor of Safety • Design of Tensile and Short Compression Members • Problems	3	2	-	8	**13**

	Topic 4	**Strain and Material Relations** • Introduction • Deformations • Strain Defined • Components of Strain • Engineering Materials • Stress –Strain Diagram • Hooke's Law and Poisson's Ratio • Generalized Hook's Law • Strain Energy • Repeated Loading: Fatigue • problem	3	2	-	8	**13**
	Topic 5	**Analysis of stress and Strain** • Introduction • Plane Stress • Principal Stresses: Maximum Shearing Stress • Mohr's Circle for Plane Stress • Variation of Stress throughout a Member • Plane Strain • Measurement of Strain • Relations Involving E, v, and G • Problems	3	1	**-**	8	**12**
	Topic 6	**Torsion** • Introduction • Behaviour of a Twisted Circular Shaft • The Torsion Formula • Stresses on Inclined Planes • Angle of Twist • Stress Concentration • Design of Circular Shafts in Torsion • Thin-Walled Hollow Members • Problems	3	2	**-**	8	**13**

	Topic 7	**Stresses in Beams** • Introduction • Classification of Beams • Shear and Moment in Beams • Load, Shear, and Moment Relationships • Shear and Moment Diagrams • Beam Behaviour in Pure Bending • Assumptions of Beam Theory • Normal Strain-Curvature Relation • Normal Stress: The Flexure Formula • Stress Concentrations • Beams of Two Materials • The Shear Formula: Shear Flow • Shear-Stress Distribution in Flanged Beams • Comparison of Shear and Bending Stresses • Design of Prismatic Beams • Design of Beams of Constant Strength • problems	**6**	2	**-**	8	**16**
	Topic 8	**Combine Stresses** • Introduction • Axial and Torsional Loads • Direct Shear and Torsional Loads: Helical Springs • Direct Shear and Bending Loads: Principal Stresses in Beams • Asymmetric Bending • Eccentric Axial Loads • The Shear Center • Yield and Fracture Criteria • Design of Transmission Shafts • problems	**3**	1	**-**	8	**12**
	Topic 9	**Inelastic Behaviour** • Introduction • Stress-Strain Diagrams for Elastoplastic Materials • Ductility and Design • Plastic Deformation and Residual Stresses • Plastic Torsion of Circular Shafts • Plastic Bending • Moment Coverture Relationship	**3**	1	**-**	8	**12**

	Practical	**Practical** • Tension test on an un notched steel • Perform compression tests on smooth cylindrical or prismatic specimens of several materials • Determine the stiffnen – to – weight ratio of one or more simply supported homogenous beams loaded with a concentrated center load • Perform torsion tests of ductile and torittle materials to shows the amount of twisting and the different modes of failure possible • Determine the location of the shear center of a small channel shaped and more complex beams • Take indentation hardnem reading using a few common metals. Observe the defamation • Learn to calibrate the machine to compensate few frictions Test the specimen at room temperature. Measure and calculate the deflection of a cantilever beam under static and dynamic loading • Test Standard Charpus Specimen. The test setup is completed; break a few specimens to check the operation and repeatability of the procedures.	**-**	-	**14**	-	**14**
	Total (Hour)		**28**	**14**	**14**	**70**	**126**

18.	**Main references supporting the course** 1. Applied Strength of Materials (5th Edition) by Robert L. Mott (Aug 31, 2007) 2. Mechanics of Materials, SI Edition by James M. Gere and Barry J. Good no (Jul 14, 2008)
	Additional references supporting the course
19.	**Other additional information** All materials will be available to the students in the library.