

**Blast Resistant Design of Structures**
**01ST1210 (PEC)**
**Objective of the Course:**

- To study the behavior of structures subjected to blast loading.
- To design blast resistant structures and detailing of it.
- To consider the effect of progressive collapse of the structures.

**Credit Earned: 3**
**Students learning outcomes:**

After successful completion of the course, it is expected that student will be able to,

1. Understand the effect of blast loading on structures.
2. Estimate blast load on structures.
3. Analyze and design structural elements against blast load.
4. Evaluate the effect of progressive collapse scenario on the structures.

**Teaching and Examination Scheme**

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	CS E (I)	IA (M)	Viva (V)	Term Work (TW)	
03	00	00	03	50	20	30	25	25	150

**Detailed Syllabus**

Sr. No.	Title of the unit	Number of hours
<b>1</b>	<b>Introduction</b>	<b>10</b>
	Introduction of blast and identification of threats, Sources of explosives, Explosion Phenomena, Historical background of blast resistant design, Blast effect on buildings, Risk assessment, Ground Shock, Interaction with Structures.	
<b>2</b>	<b>Blast Loading</b>	<b>12</b>
	Blast wave and its propagation, Factors affecting blast load, Structural Analysis for Impulsive Loading, Analysis methods to predict behaviour of blast load, Material Behaviour under High Strain-Rate of Loadings, Response of the structures to blast load, Numerical Analysis Tools for Blast Analysis using Finite Element (FE) Software	

**Structural Engineering**

<b>3</b>	<b>Blast Resistant Design and Detailing</b>	<b>14</b>
	Factors affecting blast resistant structures, Design procedure, Performance-Based Blast Design, Structural detailing, Anti-Terrorism Planning and Design of Facilities, Blast Retrofitting techniques	
<b>4</b>	<b>Progressive Collapse Analysis</b>	<b>06</b>
	Introduction and causes of progressive collapse, Concept of controlled demolition, Guidelines for progressive collapse analysis and design, Alternate methods, Case studies.	
		<b>42</b>

**Suggested Theory Distribution**

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	5%	20%	25%	25%	20%

**Instructional Method and Pedagogy:**

1. Use of Learning Management system like canvas
2. Demonstration through presentations on power point and videos and lectures
3. Brainstorming and group discussion sessions
4. Collaborative learning

**Recommended Study Material:**
**Reference Book:**

1. Dussenberry, D. O, "Handbook of Blast Resistant Design of Buildings", Wiley
2. Bangash M. Y. H. and Bangash T., "Explosion Resistant Buildings: Design, Analysis and Case studies", Springer
3. Cormie D., Mays G. and Smith, P., "Blast Effect on Buildings"
4. Bulson, P. S., "Explosive Loading of Engineering Structures", CRC Press.