



भारतीय प्रौद्योगिकी संस्थान गुवाहाटी Indian Institute of Technology Guwahati

SHORT TERM COURSE



A SHORT TERM COURSE

on

Fundamentals and Applications of Engineering Dynamics

February 27-28th, 2021 and March 5-7th, 2021

Conducted by:

Department of Mechanical Engineering



Organized by:

Knowledge Incubation for TEQIP
Centre for Educational Technology

URL: <http://www.iitg.ac.in/cet>

ABOUT THE COURSE / EVENT

Solving engineering dynamics problems by direct application of the laws of motion may not be convenient in many situations. Although, in principle, the complete motion history, i.e., finding a solution to $r(t)$ may be possible, often such information is not essential. Only the knowledge about the final result may suffice. In all such cases the application of the integrated forms of the law of motion, resulting in the conservation principles, is very useful and convenient. Furthermore, a proper understanding of these conservation principles leads to a deeper understanding of the science of motion.

The course begins with some basic concepts such as frames of reference; quantification of motion parameters, coordinate systems, particles and rigid bodies, free and constrained motion, types of forces, friction and its origin. Application of laws of motion in solving dynamics problems involving single and interconnected particles will be demonstrated. The importance of Free Body Diagram and its use in dynamics are elaborated. Concepts of impulse, momentum and Problems involving 'impulsive' forces are solved in this course. The law of motion including conservation principles, space integration and work -and energy concept are elaborated. Next the centre of mass, conservation principles (for systems of particles), rocket dynamics and Impulse - momentum approach for solving problems with varying mass will be elaborated. Some fundamental concepts of Degrees of freedom, moment of inertia of rigid bodies as well their dynamics will be discussed. Then the dynamics of rigid bodies subjected to impulsive forces are explained. Techniques of solving dynamics problems of rigid bodies in plane motion will be explained with a special case study of rigid body motion in three dimensions (gyroscopic effects). Finally, d'Alembert's principle will be explained with non-inertial frames of reference and other special effects. Application of engineering dynamics related to various fields will be presented. Introduction to finite element methods for solving the equations of Analytical Mechanics will also be provided.

The key feature of the program is that the lectures will be accompanied by interesting tutorial problems. The main speaker Prof. Amitabah Ghosh is a well-known authority on this subject. Even the faculty members will find this course quite useful. At present, there are some good books on this topic, but several students feel difficulty in understanding the subject through the book because of the involved mathematics. Hence, an online course on this subject will be very useful for the participants.

PROGRAMME SCHEDULE

Time	Topic	Speaker
Day 1		
09:00AM – 09:30 AM	Inauguration	
09:30AM – 11:00 AM	Basic concepts of dynamics	Prof. Amitabh Ghosh
11:00AM – 11:30 AM	Break	
11:30AM – 01:00 PM	A brief history of mechanics	Prof. U.S. Dixit
01:00 PM – 02:00 PM	Lunchbreak	
02:00 PM – 03:30 PM	Introduction to FEM	Prof. U.S. Dixit
03:30 PM – 04:00 PM	Break	
04:00PM – 05:30 PM	Laws of motion and Free body diagram	Prof. Amitabh Ghosh
Day 2		
09:30AM – 11:00 AM	Dynamics of a system of particles	Prof. Amitabh Ghosh
11:00AM – 11:30 AM	Break	
11:30AM – 01:00 PM	Vibration of single degree of freedom system	Prof. S.K. Dwivedy
01:00PM – 02:00 PM	Lunch break	
02:00PM – 03:30 PM	Solving dynamics problems with FEM	Prof. U.S. Dixit
03:30PM – 04:00 PM	Break	
04:00PM – 05:30 PM	Impulse-momentum concept	Prof. Amitabh Ghosh
Day 3		
09:30AM – 11:00 AM	Work-energy concept	Prof. Amitabh Ghosh
11:00AM – 11:30 AM	Tea break	
11:30AM – 01:00 PM	Vibration of 2-degree of freedom, isolation	Prof. S.K. Dwivedy
01:00PM – 02:00 PM	Lunchbreak	
02:00PM – 03:30 PM	Introduction to structural dynamics	Prof. A.K. Singh

03:30PM – 04:00 PM	Break	
04:00PM – 05:30 PM	Applications of conservation principle	Prof. Amitabh Ghosh
Day 4		
09:30AM – 11:00 AM	Impulse-momentum applied to rocket dynamics	Prof. Amitabh Ghosh
11:00 AM – 11:30 AM	Break	
11:30AM – 01:00 PM	Impact analysis of 3D printed metamaterials	Prof. B. Panda
01:00PM – 02:00 PM	Lunchbreak	
02:00PM – 03:30 PM	Vibration of continuous systems	Prof. S. K. Dwivedy
03:30PM – 04:00 PM	Break	
04:00PM – 05:30 PM	Dynamics of rigid bodies	Prof. Amitabh Ghosh
Day 5		
09:30AM – 11:00 AM	Dynamics of bodies undergoing plane motion and gyroscopic effect	Prof. Amitabh Ghosh
11:00AM – 11:30 AM	Break	
11:30AM – 01:00 PM	Pedagogy	Prof. U.S. Dixit
01:00 PM – 02:00 PM	Lunch Break	
02:00 PM – 03:30 PM	Non-inertial frame of reference and d'Alembert's principle	Prof. Amitabh Ghosh
03:30 PM – 04:30 PM	Valedictory	

ELIGIBILITY

The course/event is open to Faculty members/Students (strike off, whichever is not applicable) from TEQIP III mapped Institutions/ Engineering Colleges/ATUs. About 30% seats will be open for students and Faculty Members of other Institutions and Industry Members.

BOARDING AND LODGING

As the workshop is through online virtual mode, there will be no boarding and lodging facility.

IMPORTANT DATES

The last date for the receipt of duly sponsored application:

By email: scanned copy: 15/02/2021

Hard copy must reach by: 24/02/2021

Intimation of selection: 16/02/2021

Registration Fee:

TEQIP members - No registration Fee

Non-TEQIP faculty members - ₹ 2500 + 18% GST /-

Non-TEQIP student members - ₹ 1000 + 18% GST /-

Industry Members - ₹5000 + 18% GST /-

Banking Details:

Branch Name - IIT Guwahati Branch

Bank Name- State Bank of India

Branch Code- 14262

Account Number - 33755947572

IFSC Code- SBIN0014262

SELECTION CRITERIA

Number of seats: 70

Selection will be based on First cum first served basis.

ADDRESS FOR CORRESPONDENCE

Dr. Biranchi Panda and Prof. U.S. Dixit

Course Coordinators

Department of Mechanical Engineering

Indian Institute of Technology Guwahati

Guwahati- 781 039

Email: pandabiranchi@iitg.ac.in , uday@iitg.ac.in

Ph.: 0361-258-2684 (O), 2657(O)

Application Form

1. Name (block letters):

2. Sex: Male Female

3. Category: General Reserved

4. Highest Academic Qualification:

5. Specialization:

6. Designation & pay scale:

7. Name of the organization:

8. Experience:

(a) Teaching:

(b) Industrial:

9. Address for communication:

Pin code:

Mobile No.:

E-mail:

Please register me for the course on “**Fundamentals and Applications of Engineering Dynamics**” to be held via *online mode* at IIT Guwahati.

I am sending an advance copy of this application by email to the coordinator of the course.

I undertake to send the Hard copy signed by the Head of my Institution.

Place:

Date:

Signature of the applicant

SPONSORSHIP / NOMINATION CERTIFICATE

Prof/Dr./Mr./Ms./Mrs./

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is an employee/student of our institute and his/her application is hereby sponsored/nominated. The applicant is permitted to attend the online short-term course/workshop on “Fundamentals and Applications of Engineering Dynamics” at IIT Guwahati during 27-28th February, 2021 and 5-7th March, 2021 if selected.

I also certify that our institute/college is/is not (strike over which is not applicable) under the “Institution List” of 3rd phase of TEQIP Project of MHRD.

Date

Signature of Authority

Designation

Official Seal

Selected participants will be informed by e-mail. The duly sponsored/nominated application form should be mailed to:

(Name of the Course Coordinator)

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Department of Mechanical Engineering

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Email.: pandabiranchi@iitg.ac.in and uday@iitg.ac.in;

Website: <https://www.iitg.ac.in/mech/TEQIP.php>

ABOUT TEQIP

TEQIP conceived in pursuance of the NPE-1986 (revised in 1992) by Government of India as a long term program to be implemented in different phases. After successful execution of TEQIP II, TEQIP III starts from 2017-18 as Central Sector Scheme with a focus on the Low Income States, Northeast, Hill States and Islands. The third phase of TEQIP is also special in a way that it incorporates twinning arrangements between mentee & mentor institutions with an emphasis on Focused Training (PT) and Focused Interventions from IITs in terms of deliverables and accountability. KIT, established at IIT Guwahati under 2nd phase of TEQIP is a focal point for training Faculty, Staff and students from TEQIP-III institutions in Knowledge Engineering, Content Creation, Improving Teaching, Pedagogy & administrative skills in identified niche areas/ disciplines.

ABOUT KIT

KIT (**K**nowledge **I**ncubation **C**ell for **TEQIP**) at IIT Guwahati functions as a multi-disciplinary as well as interdisciplinary Innovation Incubation Centre with a focus to impart Knowledge, infusing innovation and leading a path to achieve academic excellence. Its activities are in the area of improving quality of technical education, incubator of Innovative Ideas; implementer of contemporary pedagogy practices and development of Learning Content in Technical institutions while mentoring them.

ABOUT IIT GUWAHATI

SNAP OF CAMPUS

IIT Guwahati campus is spread over a sprawling 785 hectares plot of green land on the north bank of the river Brahmaputra around 25 km from the heart of the city. With hills and vast open spaces, the campus provides an ideal setting for training. Details on how to reach IITG Campus are available on the institute website

Website: www.iitg.ac.in