

<b>COURSE TITLE</b>	<b>IMMERSIVE TECHNOLOGY FOR MECHANICAL ENGINEERING</b>
<b>COURSE CODE</b>	<b>01ME0744</b>
<b>COURSE CREDITS</b>	<b>4</b>

**Objective:**

- 1 The course is prepared to provide the basic understating of Immersive Technology in mechanical engineering

**Course Outcomes:** After completion of this course, student will be able to:

- 1 Apply practical skills to design and develop AR and VR applications for mechanical engineering systems.
- 2 Analyze the foundations, evolution, and challenges of immersive technologies in mechanical engineering.
- 3 Critically analyze and evaluate real-world case studies, and propose innovative applications of immersive technologies including Metaverse-based engineering solutions.
- 4 Integrate immersive technologies into mechanical engineering problem-solving, such as Digital Twin and simulation-based applications.
- 5 Evaluate different hardware and software platforms for AR/VR to determine their suitability for specific engineering applications.

**Pre-requisite of course:**NA

**Teaching and Examination Scheme**

<b>Theory Hours</b>	<b>Tutorial Hours</b>	<b>Practical Hours</b>	<b>ESE</b>	<b>IA</b>	<b>CSE</b>	<b>Viva</b>	<b>Term Work</b>
3	0	2	50	30	20	25	25

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
1	<b>Introduction to Immersive Technology</b> Introduction to Immersive Technology, History and Evolution of Immersive Technology, Advantages and Disadvantages of Immersive Technology, Challenges to implementing Immersive Technology in mechanical engineering, Various platforms to build Immersive Technology, Application and use cases	8
2	<b>Augmented Reality:</b> AR hardware and software, AR Displays and Interaction, AR Technologies and Techniques,, AR Applications, Creating AR Content, AR Development Platforms, , User Experience (UX) Design for AR, Challenges and Considerations, Case Studies	8

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
3	<b>Virtual Reality</b> VR Hardware and Immersion, VR Tracking and Motion Control, VR Software and Development Tools, VR User Experience (UX) Design, VR Content Creation and Simulation, VR Applications and Use Cases	8
4	<b>Digital Twin</b> Introduction to Digital Twins, Types of Digital Twins, Digital Twin Components, Digital Twin Technologies and Platforms, Creating and Managing Digital Twins, Applications of Digital Twins, Benefits and Challenges of Digital Twins, Digital Twins in Engineering and Product Development, Digital Twins and Industry 4.0	8
5	<b>Metaverse:</b> Introduction to the Metaverse, Foundations of the Metaverse, Metaverse Architectures and Technologies, Metaverse Platforms and Companies, Metaverse Use Cases and Applications, Metaverse and Virtual Economies, Future Trends and Opportunities in the Metaverse	12
<b>Total Hours</b>		<b>44</b>

#### Suggested List of Experiments:

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
1	<b>Identify the value creation through immersive technology in mechanical engineering.</b> 1. Identify the value creation through immersive technology in mechanical engineering.	2
2	<b>Development of AR application for Pump</b> Development of AR application for Pump.	2
3	<b>Development of AR application for Turbine</b> Development of AR application for Turbine	2
4	<b>Development of AR application for IC engine.</b> Development of AR application for IC engine.	2
5	<b>Development of AR application for Gearbox.</b> Development of AR application for Gearbox.	2
6	<b>Development of VR application for thermal power plant.</b> Development of VR application for thermal power plant	2
7	<b>Development of VR application for hydro power plant</b> Development of VR application for hydro power plant	2
8	<b>Development of VR application for Foundry</b> Development of VR application for Foundry	2
9	<b>Development of Digital Twin application for lathe machine</b> Development of Digital Twin application for lathe machine	2
10	<b>Development of Digital Twin application for welding machine.</b> 10. Development of Digital Twin application for welding machine.	2

### Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
11	<b>Development of Digital Twin application for Foundry</b> 11. Development of Digital Twin application for Foundry.	2
12	<b>Case study on Metaverse for industry</b> 12. Case study on Metaverse for industry	2
<b>Total Hours</b>		<b>24</b>

### Textbook :

- 1 Augmented Reality: Principles and Practice, Dieter Schmalstieg and Tobias Hollerer, , Addison-Wesley Professional, 2016
- 2 The Fourth Transformation: How Augmented Reality and Artificial Intelligence Will Change Everything , Robert Scoble and Shel Israel , Patrick Brewster Press, 2016

### References:

- 1 Virtual Reality Insider: Guidebook for the VR Industry , Virtual Reality Insider: Guidebook for the VR Industry , Sky Nite, VR Insider, 2014
- 2 Digital Twin Development and Implementation: Smart Systems to Cities, Digital Twin Development and Implementation: Smart Systems to Cities, Michael J. Williams, Springer, 2023
- 3 Immersive Technology in Smart Cities: Augmented and Virtual Reality in IoT (EAI/Springer Innovations in Communication and Computing), Immersive Technology in Smart Cities: Augmented and Virtual Reality in IoT (EAI/Springer Innovations in Communication and Computing), Sagaya Aurelia (editor), Sara Paiva (editor), Springer, 2021
- 4 Augmented Reality and Virtual Reality: New Trends in Immersive Technology, Augmented Reality and Virtual Reality: New Trends in Immersive Technology, M. Claudia tom Dieck (editor), Timothy H. Jung (editor), Sandra M. C. Loureiro (editor), Springer, 2021
- 5 Twin-Control: A Digital Twin Approach to Improve Machine Tools Lifecycle, Twin-Control: A Digital Twin Approach to Improve Machine Tools Lifecycle, Mikel Armendia, Mani Ghassempouri, Erdem Ozturk, Flavien Peysson, Springer International Publishing, 2019

### Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as 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 / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	20.00	20.00	20.00	20.00	10.00

**Instructional Method:**

- 1 PPT

**Supplementary Resources:**

- 1 <https://youtube.com/playlist?list=PLbMVogVj5nJSyt80VRXYC-YrAvQuUb6dh&si=fzw0t0ijh9MhP31x>