### B.Tech (Mechanical Engineering) Laboratory Mapping with Virtual Laboratory as available in the Web Page ([http://www.vlab.co.in/broad-area-mechanical-engineering](http://www.vlab.co.in/broad-area-mechanical-engineering)) for the New Syllabus effective from 2018

<table>
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<tr>
<td>I</td>
<td>ES-ME192</td>
<td>Workshop/ Manufacturing Practices</td>
<td>Workshop Practice:  1. Machine shop (10 hours) 2. Fitting shop (8 hours) 3. Carpentry (6 hours) 4. Electrical &amp; Electronics (8 hours) 5. Welding shop (8 hours (Arc welding 4 hrs + gas welding 4 hrs)) 6. Casting (8 hours) 7. Smithy (6 hours) 8. Plastic moulding &amp; Glass Cutting (6 hours)</td>
<td>NIL</td>
<td>NIL</td>
<td>NIL</td>
<td>Till now not recommended</td>
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<td>II</td>
<td>ES-ME291</td>
<td>Engineering Graphics &amp; Design</td>
<td>1. Introduction to engineering design and its place in society 2. Exposure to the visual aspects of engineering design 3. Exposure to engineering graphics standards 4. Exposure to solid modelling 5. Exposure to computer-aided geometric design 6. Exposure to creating working drawings 7. Exposure to engineering communication</td>
<td>NIL</td>
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| IV       | PC-ME491   | Practice of Manufacturing Processes and Systems | 1. Laboratory modules of pneumatics and/or electro-pneumatics  
2. Laboratory modules of hydraulics and/or electro-hydraulics  
3. Study of working of Logic Gates practically  
4. Simulation of designed pneumatics / hydraulics systems  
5. Measurement of surface roughness  
6. Measurement of tapered objects using Sine Bar and using balls and rollers, etc.  
7. Measurement of threads using three wire method  
8. Measurement of gears  
9. Measurement of bore diameter using micrometer and gauges  
10. Measurement of angles using bevel vernier protractor  
11. Statistical process control system to apply to measured dimension of samples  
12. Practicing different gauges to assess angles, thread, internal and external radius, etc. | NIL | NIL | NIL | This paper is having few practising (S.No.1-3, 5-10,12) and few simulation modules (S.No.4, 11). No Virtual Lab facility is found in these modules. |
| IV       | PC-ME492   | Machine Drawing | about 10 assignments with the focus given as outlined below:  
1. Projection and Isometric Drawing of Machine components- Assembly and detailing  
2. There should be on-drawing board assignments and assignments to make using a graphic software  
3. Development of surface to make in 1 or 2 assignments | NIL | NIL | NIL | Till now not recommended |
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| V        | PC-ME591   | Mechanical Engineering Laboratory (Thermal) I | 1. Measurement of coefficient of discharge of given Orifice and Venturi meters  
2. Determination of the density & viscosity of an oil and friction factor of oil flow in a pipe  
3. Determination of the performance characteristics of a centrifugal pump  
4. Determination of the performance characteristics of Pelton Wheel  
5. Determination of the performance characteristics of a Francis Turbine  
6. Determination of the performance characteristics of a Kaplan Turbine  
7. Determination of the thermal conductivity and specific heat of given objects  
8. Determination of the calorific value of a given fuel and its flash & fire points  
9. Determination of the p-V diagram and the performance of a 4-stroke diesel engine  
10. Determination of the convective heat transfer coefficient for flow over a heated plate  
11. Determination of the emissivity of a given sample  
12. Determination of the performance characteristics of a vapour compression system | Rotating Machinery Fault Simulation | Cavitation of Centrifugal Pump | IIT Kharagpur | S.No.3 is having a somewhat related Virtual Lab in Fluid Mechanics and Machinery area. |
|          |            |               |                         | Remote Triggered Virtual Lab on Automotive Systems | 1. PV Diagram of a SI Engine  
2. Torque Crank Angle Curve of a SI Engine  
3. Load Test on a SI Engine  
4. Mechanical Efficiency of a SI Engine  
5. Determination of Cylinder Mean Effective Pressure | IIT Kharagpur | Only IC Engine based Virtual Labs are there. |
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| V        | PC- ME592  | Machine Drawing | About 10 assignments to do as under: UNIT - I Projection and Isometric Drawing of Machine components 1. **Fasteners:** Drawings of various views of Screw threads, metric and BSW threads, Square thread and multi start threads. Nut bolts, Washers, Setscrew, Locknuts and foundation bolts. Riveted joints: Forms and proportions of riveted Lap and Butt joints.


UNIT - II Assignments using graphic software
1. **Assembly and detailed drawings:** Tool head of a shaping machine; Engine parts: Eccentric, Piston, Cross head and Connecting rod; Valves: Steam stop valve, Anyone of safety, relief and non-return valves; Solid modeling of Plummer block | NIL | NIL | NIL | Till now not recommended |


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| VI       | PC-ME691   | Mechanical Engineering Laboratory (Design) II | 1. Uniaxial tension test on mild steel rod  
2. Torsion test on mild steel rod  
3. Impact test on a metallic specimen  
4. Brinnell/ Vickers and Rockwell hardness tests on metallic specimens  
5. Bending deflection test on beams  
6. Strain measurement using Rosette strain gauge, or like.  
7. Microscopic examination of heat-treated and untreated metallic samples  
8. Determination of velocity ratios of simple, compound, epicyclic and differential gear trains  
9. Studying kinematics of four bar, slider crank, crank rocker, double crank, double rocker and oscillating cylinder mechanisms  
10. Studying kinematics of typical mechanisms like pantograph, some straight line motion mechanisms, wiper, drafter, etc.  
11. Motion studies of different cams & followers  
12. Single degree of freedom Spring-mass-damper system: determination of natural frequency and damping coefficient  
13. Determination of torsional natural frequency of single and double rotor systems- undamped and damped natural frequencies  
14. Studying machine vibration using sensor  
15. Solving simple balancing problems experimentally | Nil for S.No. 1-8, 14. | 1. Oldham Coupling Mechanism  
2. A quick return mechanism  
3. CAM follower mechanism | IIT Kharagpur | S.No.1,2 of V.L. can be against S.No.10, & S.N.3 of V.L. can be of S.No. 11. |
|          |            | Mechanics and Robotics Lab |  |  |  |  |  |
|          |            | Dynamics of Machine Lab | 1. Proell Governor  
2. Porter Governor  
3. Hartnell Governor  
4. Dynamics analysis of slider crank mechanism  
5. Dynamics analysis of Four bar mechanism  
6. Balancing of multiple mass in single plane  
7. Balancing of Multiple Mass in Multiple Plane  
8. Disc Type Flywheel  
9. Rim Type Flywheel | 1. Forced response of SDOF  
2. Free response of SDOF | NIT Karnataka | S.No. 1-5, 8,9 of V.L. can be additional expts. Under this Lab. |
|          |            | Vibration and Acoustics Lab |  |  |  |  |  |
|          |            | Rotating Machinery Fault Simulation |  |  |  |  |  |
|          |            | Mechanics of Machine lab | 1. Position analysis of Grashof four bar mechanism  
2. Velocity analysis of Grashof four bar mechanism  
3. Acceleration analysis of Grashof four bar mechanism  
4. Position analysis of NonGrashof four bar mechanism  
5. Velocity analysis of NonGrashof four bar mechanism  
6. Acceleration analysis of NonGrashof four bar mechanism | Static Balancing Studies of Rotary Systems  | IIT Kharagpur | This one of V.L. can be of S.No. 15. |
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|          |            |                        |  |  |  |  |  |</p>
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<th>Machine Dynamics and Mechanical Vibrations</th>
<th>1. Free vibration of cantilever beam</th>
<th>NIT Karnataka</th>
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<tr>
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<td>2. Free vibration of simply supported beam</td>
<td>S.No. 1-4, 6,7 of V.L. can be of S.No. 12,13 and additional expts.</td>
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<td>3. Free vibration of fixed beam</td>
<td>S.N. 5 of V.L. can be of S.No. 15.</td>
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<td>4. Forced vibration of SDOF system</td>
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<td>5. Rotating Unbalance</td>
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<td>6. 2DOF Forced vibration</td>
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<td>7. Dynamic Vibration Absorber</td>
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1. Free vibration of cantilever beam
2. Free vibration of simply supported beam
3. Free vibration of fixed beam
4. Forced vibration of SDOF system
5. Rotating Unbalance
6. 2DOF Forced vibration
7. Dynamic Vibration Absorber
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| VII      | PC-ME791    | Mechanical Engineering Laboratory III (Manufacturing) | 1. Measurement of Cutting Force in Turning  
2. Study of the effect of parametric variation in arc welding  
3. Testing of moulding sand  
4. Testing for Weld Quality  
5. Study of and Solving problems on geometry of robot manipulator, actuators and grippers  
6. Programming on CNC Lathe using G and M Codes  
7. Programming on CNC Lathe using APT  
8. Programming on CNC Milling Machine using G and M Codes  
10. Programming on CNC machine Simulator and to observe virtual machining  
11. Robot Programming  
12. Experiments on AJM/ USM/ WEDM/ EDM/ ECM/ LBM  
13. Design and manufacture of products using Additive Manufacturing | Nil for S.No. 1-4, 6-9, 12,13. | Nil | Nil | No V.L. for S.No. 1-4, 6-9, 12,13 |
|          |             |                                    |                                                              |                    |                    |                    |                  |
|          |             | FAB laboratory                      | 1. Computer Controlled Cutting of wooden object  
2. 3D Machining  
3. 3D scanning  
4. Molding and Casting of Polyurethane parts.  
5. Digital Fabrication and Project Development |                    |                    | COE Pune | S.No.1-2 of V.L. are of S.No.10.  
S.No. 3-5 of V.L. can be additional expts. Under this lab. |
|          |             | Mechanisms and Robotics Lab        | 1. Movemaster  
2. Forward Kinematics of PUMA 560  
3. Inverse Kinematics of PUMA 560 |                    |                    | IIT Kharagpur | These of Virtual Lab are of S.No. 5,11. |