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

Semester	Paper Code	Name of Paper	Name of Lab/ Experiment	Mapped Virtual Lab	Name of Experiment	Offering Institute	Remarks
I	**ES-ME192**	Workshop/ Manufacturing Practices	Workshop Practice: 1. Machine shop (10 hours) 2. Fitting shop (8 hours) 3. Carpentry (6 hours) 4. Electrical & 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 & Glass Cutting (6 hours)	NIL	NIL	NIL	Till now not recommended
II	**ES-ME291**	Engineering Graphics & Design	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	NIL	NIL	NIL	Till now not recommended
III	**PC-ME391**	Practice of Manufacturing Processes	1. Machine Shop: Taper turning, drilling, boring, shaping and milling operations- 3 modules 2. Pattern Making: 1 or 2 wooden patterns to make- 2 modules 3. Moulding: 1 module 4. Smithy Shop: 1 module 5. Welding Shop: Practicing SMAW, Gas Welding and/or GMAW- 2 modules 6. Fitting Shop: 2 modules 7. Sheet Metal Shop: 1 module	NIL	NIL	NIL	Till now not recommended

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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 simulationmodules (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	In thermal area, 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 river heads, Different views of different types of riveted Lap and Butt joints. 2. **Drawings of various views of Shaft joints:** Cotter joint and Knuckle joint. Keys & Shaft coupling: Muff, Flanged, Flexible, Universal and Oldhams coupling. **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.	Nil	Nil	No V.L. for S. No.1-8,14.
				Mechanisms and Robotics Lab	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.
				Dynamics of Machine Lab	1. Proell Governer 2. Porter Governer 3. Hartnell Governer 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	NIT Karnataka	S.No. 1-5, 8,9 of V.L. can be additional expts. Under this Lab. S.No. 6-7 of V.L. can be of S.No. 15.
				Vibration and Acoustics Lab	1. Forced response of SDOF 2. Free response of SDOF	COE Pune	S.No. 1,2 of V.L. can be of S.No. 12.
				Rotating Machinery Fault Simulation	Static Balancing Studies of Rotary Systems	IIT Kharagpur	This one of V.L. can be of S.No. 15.
				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	NIT Karnataka	S.No. 1-10 of V.L. can be of S.No. 9. S.No. 11-16, 19-24 of V.L. can be of S.No. 10. S.No. 17, 18 of V.L. can be of S.No. 11.

					7. Position analysis of Slider crank mechanism 8. Velocity analysis of Slider crank mechanism 9. Acceleration analysis of Slider crank mechanism 10. Position analysis of Slider crank mechanism with Offset 11. Position analysis of Scotch Yoke Mechanism 12. Velocity analysis of Scotch Yoke Mechanism 13. Acceleration analysis of Scotch Yoke Mechanism 14. Position analysis of Elliptical Trammel 15. Hart Straight Line Mechanism 16. Peaucellier Straight Line Mechanism 17. Elliptical Cam Mechanism 18. Eccentric Cam Mechanism 19. Klann Mechanism 20. Jansen Linkage Model 21. Tchebichev Straight Line Mechanism 22. Whitworth Mechanism 23. Crank and Slotted Mechanism 24. Universal Joint		
				Machine Dynamics and Mechanical Vibrations	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	NIT Karnataka	S.No. 1-4, 6,7 of V.L. can be of S.No. 12,13 and additional expts. S.N. 5 of V.L. can be of S.No. 15.

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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 9. Programming on CNC Milling Machine using APT 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.