Lokmanya Tilak Jankalyan Shikshan Sanstha's
PRIYADARSHINI COLLEGE OF ENGINEERING
(Recognised by A.I.C.T.E., New Delhi & Govt. of Maharashtra, Affiliated to R.T.M.Nagpur University)
Near CRPF Campus, Hingna Road, Nagpur-440 019, Maharashtra (India)
Phone : 07104 – 236381, 237307, Fax : 07104 – 237681,
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1.3.2 Average percentage of courses that include experiential learning through project work/field work/internship during last five years

2018-19

1.3.2 Average percentage of courses that include experiential learning through project work/field work/internship during last five years

B.E – MECHANICAL ENGINEERING M-TECH-MECHANICAL ENGINEERING DESIGN

Sr. No	Name of the course that include experiential learning through Project work/ Internship	Subject Cod	Domain	Page No
1	Kinematics Of Machines	BEME302T	**Design**	**8, 24, 32, 36**
2	Machine Drawing	BEME306P		
3	Design of Machine Elements	BEME502T		
4	Computer Aided Design	BEME703T/P		
5	Design of Mechanical Drives	BEME705T/P		
6	Mechanics Of Material	BEME405T/P		
7	Dynamics of Machines	BEME605T/P		
8	Elective – I: Tool Design	BEME702T2		
9	Elective – I: Advance I.C. Engines	BEME803T5		
10	Dynamics of Machinery	PGMED102T		
11	Advanced Mechanical Drives	PGMED201T		
12	Design of Mechanical Handling System	PGMED203T		
13	Elective III-Tribology And Bearing Design	PGMED204T		
14	Finite Element Analysis	PGMED207P		
15	Elective IV-Finite Element Analysis	PGMED301T		

16	Elective IV-Optimization in Engg. Design	PGMED301T		
17	Stress Analysis	PGMED202T/P		
18	Mechanical Vibrations	PGMED103T/P		
19	Advanced Mechanisms	PGMED101T/P		
20	Manufacturing Process	BEME304T/P	**Production**	**4,** **28**
21	Machining Processes	BEME404T/P		
22	Advanced Production Processes	BEME503T		
23	Automation in Production	BEME804T/P		
24	Industrial Engineering	BEME701T		
25	Industrial Economics & Entrepreneurship Development	BEME501T		
26	Industrial Management	BEME801T		
27	Engineering Metallurgy	BEME305T/P		
28	Mechanical Measurement & Metrology	BEME505T/P		
29	Operations Research	BEME603T		
30	Elective – I: Industrial Robotics	BEME702T1		
31	Engineering Thermodynamics	BEME402T	**Thermodynamics**	**12,** **20,** **16**
32	Fluid Mechanics	BEME303T		
33	Hydraulics Machines	BEME403T/P		
34	Heat Transfer	BEME504T/P		

35	Energy Conversion- I	BEME601T		
36	Energy Conversion - II	BEME704T/P		
37	Energy Conversion - III	BEME805T/P		
38	Elective – II: Industrial Fluid Power	BEME802T3/P3		
39	Elective – III: Renewable Energy Systems	BEME803T3		
40	Elective III-Design of Hydraulic And Pneumatic System	PGMED204T		
41	Industrial Visit	BEME507P	**Other**	
42	Industrial Case Study	BEME608P		
43	Mini Project	BEME407P		
44	Project Seminar	BEME706		
45	Project Seminar	PGMED303P		
46	Project	BEME806P		
47	Project	PGMED401P		
48	Control Systems Engineering	BEME602T		
49	Computer Applications – I	BEME506T		
50	Mechatronics	BEME604T/P		
51	Functional English	BEME606T		
52	Computer Applications – II	BEME607P		
53	Technical Report and Seminar	BEME307P		
54	Environmental Studies	BEME406T		

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering and Technology
B.E. (MECHANICAL ENGINEERING): FOURTH SEMESTER

BEME304T: MANUFACTURING PROCESSES (Theory)

CREDITS: 04

Teaching Scheme
Lectures: 3 Hours/Week
Tutorial: 1 Hour/Week

Examination Scheme
Duration of Paper: 03 Hours
University Assessment: 80 Marks
College Assessment: 20 Marks

Course Objectives and Expected Outcomes: This course is designed to provide students with an overview of a wide variety of manufacturing processes for processing of engineering materials. Students will learn principles, operations and capabilities of various moulding, metal casting, metal forming, press working, metal joining processes & also processing on plastics. Upon completion of this course, students shall understand the importance of manufacturing processes and be able to select and apply suitable processes for an engineering product.

UNIT – I **[8 Hrs.]**

Pattern Making & Moulding: - Pattern making: Types, materials used, Pattern making allowances, color codes. Core making: - Types, core material & its properties. Moulding: Types of sand moulds, moulding sand composition. moulding sand properties, moulding machines. Shell moulding, CO_2 moulding.

UNIT – II **[8 Hrs.]**

Gating System & Casting Processes: - Gating design -Elements of gating systems, pouring equipments, riser design Melting furnaces -Types, Electric furnace, Induction furnace, Cupola-construction & operation. Cleaning, inspection & casting defects. Foundry mechanizing Special casting processes such as investment Casting, Centrifugal Casting, Slush Casting and Die Casting.

UNIT – III **[8 Hrs.]**

Joining Processes: - Introduction to metal Joining- Types of Welding. Arc Welding & Gas Welding Processes, Defects & Inspection of Welding Joints, Electrodes, weldability of Metals, Welding equipments. Fixtures, TIG Welding, MIG Welding, Spot Welding.

UNIT – IV **[8 Hrs.]**

Forming Process for metals:- Rolling, Forging, Extrusion, Drawing, Mechanics of forming process, Determination of Rolling pressure and roll specification force, drive force and torque, power loss in bearing, Determination of forging forces and stresses, Equipment (hammer/press) capacity required. (No analytical treatment)

UNIT – V **[8 Hrs.]**

Press Working: - Classification, types of presses, press terminology, Force analysis in press working, Die cutting operation, types of dies, Die and punch allowance, introduction to shaping operations, bending, forming and drawing.

UNIT – VI **[8 Hrs.]**

Introduction to Plastics, Properties & types, applications, Forming & Shaping of plastics – Extrusion, injection moulding, Blow moulding, wire drawing, Compression moulding, Transfer moulding, Embossing, Calendaring.

Introduction to Joining of Plastics- Mechanical Fastening, Spin Welding, Solvent Bonding, Ultrasonic welding, Induction welding, Dielectric welding, Hot Plate welding, Vibration welding, Hot gas welding.

TEXT BOOKS:

1. Workshop Practice, H. S. Bawa, Tata Mc-Graw Hill
2. Manufacturing Engineering & Technology, Kalpakjian, Pearson
3. Modern Materials and Manufacturing Process, R. Gregg Bruce, John E. Neely, Pearson Education
4. Workshop Technology (Volume I), Hajra Chaudhary, Media Promoters & Publishers
5. Workshop Technology (Vol. I & II), B. S. Raghuwanshi, Dhanpat Rai & Co.
6. Manufacturing technology (Vol. I), P. N. Rao, Tata Mc-Graw Hill
7. Manufacturing Science, Ghosh & Malik, East West Press.
8. Textbook of Production Engineering, P.C. Sharma, S. Chand & Co.

REFERENCE BOOKS:

1. Workshop Technology, Vol I & II, WAJ Chapman, Elsevier Butterworth-Heinemann.
2. Manufacturing Processes, M. Begman.
3. Processes & Materials of Manufacturing, R. Lindberg, Allyn & Bacon.

PRIYADARSHINI COLLEGE OF ENGINEERING,
NAGPUR (M.S.)
DEPARTMENT OF MECHANICAL ENGINEERING

Certificate

It is to certify that this is a bonafide record of Project Work entitled

"IMPROVING PRODUCTIVITY OF LEAF SPRING MANUFACTURING INDUSTRY BY USING LEAN MANUFACTURING TECHNIQUES"

Carried out by

140	**Rishabh S. Meshram**	**115**	**Chetan R. Akare**
248	**Tejasvikumar D. Lilhare**	**136**	**Pushpak B. Umare**
149	**Stephen A. Bhatkar**	**214**	**Pratik V. Satpute**

Of 8th Semester
B.E. MECHANICAL ENGINEERING
During the academic year of 2018-19 in partial fulfillment of the requirement for the award of the degree of
BACHELOR OF ENGINEERING
Offered by

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR (M.S.)

Dr. I. A. Khan
(Project Guide)

Prof. S. P. LOKHANDE
(Project Coordinator)

Dr. K. S. ZAKIUDDIN
(Head of the Department)
Professor & Head
Department of Mechanical Engg
Priyadarshini College of Engg
Nagpur-19

Dr. M. P. SINGH
(Principal)

ABSTRACT

Manufacturing units is always facing a challenge regarding to the cost-reduction, product quality and efficiency in their operations. Industry requires to meet up the optimum Production Lead Times and costs as well as high customer services to survive in the market. Because of this, industries are focusing more on the customers need and satisfaction. In this work Various Lean Manufacturing tools to be used in Leaf Spring manufacturing industry by focusing both on processes and their cycle times used for Leaf Spring manufacturing. In order to apply the lean manufacturing, Value Stream Map (VSM) to be drawn by defining the resources and activities needed to manufacture and deliver the product. The study of current state map will show the areas for improvement and will help to identify the different types of wastes. From the current state map, it will be noticeable that the inventory can be reduced for the Leaf Spring. With the help of lean manufacturing tools, we can identify embedded wastes, which had been neglected before in the working process. Waste activities such as waiting, redoing and batching are generally not modeled by other tools, however in value stream mapping those wastes can be easily identified. The lead time and Process time to be reduced and the efficiency of this process can be increased with the help of value stream mapping.

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering and Technology
B.E. (MECHANICAL ENGINEERING): FIFTH SEMESTER

BEME502T: DESIGN OF MACHINE ELEMENTS (Theory)

CREDITS: 04

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hours/Week	Duration of Paper: 03 Hours
Tutorial: 1 Hour/Week	University Assessment: 80 Marks
	College Assessment: 20 Marks

Course Objectives and Expected Outcomes: This course is designed to understand the basic machine element design. It includes the procedure of design (w.r.t. basic failures) under various loading conditions. Students shall understand design of various mechanical joints, machine components such as shaft, keys, brakes clutches, power screws etc. Apart from this, students shall learn spring design & pressure vessel design. At the end of this course, students will get familiar with design of these mechanical components under various loading conditions.

UNIT – I **[12 Hrs.]**

Introduction to Mechanical Engineering Design, Design methods, Aesthetic and Ergonomics Consideration in design , Material properties and their uses in design , Basic 'principles of Machine Design, Modes of failures, I. S. codes, Preferred Series and numbers. Design of Knuckle joint, Socket & Spigot type cotter joint. Design of riveted joint.

UNIT – II **[12 Hrs.]**

Design of bolted and welded joints under axial and eccentric loading conditions. Design of Brackets & Levers.

Design of Cylinder & Pressure Vessels: Types of pressure vessel, stresses induced in pressure vessel, Lame's, Clavarino's and Bernie's equations. Design of cylindrical & spherical pressure vessels. Design of nut, bolt, gasket & covers for pressure vessel.

UNIT – III **[12 Hrs.]**

Design of shaft for power transmission, static and fatigue criteria for shaft design, ASME codes for shaft design, Design of keys.

Design of Springs: Spring material, Helical compression & tension springs under static and variable loads, Leaf spring, Laminated Springs.

UNIT – IV **[12 Hrs.]**

Design of power screw: Thread forms, multiple threaded screws, terminology of power screw, design of screw jack.

Design of clutches and brakes: Single and multiple plate clutch, constant wear and constant pressure theory for plate clutches, Internal and external shoe brakes.

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TEXT BOOKS:

1. Design of Machine Elements, B.D.Shiwalkar, Central Techno Publications
2. Design of Machine Elements, V. B. Bhandari, Tata McGraw Hill Pub.
3. Mechanical Engineering Design, J. E. Shigley, McGraw Hill.
4. Design Data Book, B.D.Shiwalkar, Central Techno Publications.
5. Design Data Book, PSG.
6. Design Data Handbook Book, K. Mahadevan, CBS Publishers.
7. Mechanical Design of Machine Elements & Machines, J.A.Collins, Wiley India
8. Machine Components Design, Robert C., Juvinall & Kurt M. Marshek, Wiley India
9. Machine Design, U.C. Jindal, Pearson Publications
10. Machine Design : An Integrated Approach, Robert L Norton, Pearson Publications
11. Machine Design Fundamental and Applications, P.C. Gope, PHI Learning.
12. Design of Machine Elements, Sharma C.S. & Purohit K, PHI Learning.

REFERENCE BOOKS:

1. Design of Machine Elements, Spotts M. F. and Shoup T. E., Pearson Publications.
2. Machine Design, Black P. H. and O. Eugene Adams, McGraw Hill Book Co Inc.

PRIYADARSHINI COLLEGE OF ENGINEERING, NAGPUR (M.S.)

DEPARTMENT OF MECHANICAL ENGINEERING

Certificate

It is to certify that this is a bonafide record of Project Work entitled

"DESIGN AND FABRICATION OF MARKING MACHINE FOR TRACTOR COMPONENTS MANUFACTURING INDUSTRY"

Carried out by

127	KAMLESH B. SAKHARE	161	KASHIF HASSAN
139	RAKESH J. YADAV	162	MD. DANISH R. KHAN
157	VIKKY K. LOKHANDE	164	NOOR HASAN KHAN

of 8th Semester
B.E.MECHANICAL ENGINEERING
during the academic year of 2018-19 in partial fulfillment
of the requirement for the award of the degree of
BACHELOR OF ENGINEERING
offered by

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR (M.S.)

Dr. I. A. KHAN
(PROJECT GUIDE)

Prof. S. P. LOKHANDE
(PROJECT COORDINATOR)

Dr. K. S. ZAKIUDDIN
(HEAD OF THE DEPT.)

Dr. M. P. SINGH
(PRINCIPAL)

ABSTRACT

This project was done in a small scale industry that was Shree Sai Engineering Pvt. Ltd. which is located in the Hingna, MIDC, Nagpur.

The goal of the project was develop a manual type mechanical equipment to fulfil the demand and requirement of the industry. The project was done by collecting all the information about the process of marking which is previously carried out by the help of hammer and punch tool at the one end of this tool the letters are present. Due to use of this old method of marking is not fulfil the safety of the worker, hence by determining to develop and design a manual type or hand operated machine which is the solution of this project. The safety is providing by using the manual operated type marking machine. As per the requirement of the industry the machine which was designed are portable, light in weight, less space, easy to handle or operate etc. Also the price of the machine is less and affordable.

As the result of this project, it can be said that the machine which is designed or develop it increase the safety of worker, and the rate of marking get increased by some amount by the new machine and hence it saves time.

In this project, it is seen that equipment or machine design made the working is simple and ensure the safety of worker. In future the development of this marking machine is possible for increasing the rate of marking process and reducing the ideal timing during this process.

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering and Technology

B.E. (MECHANICAL ENGINEERING): FOURTH SEMESTER

BEME402T: ENGINEERING THERMODYNAMICS (Theory)

CREDITS: 04

Teaching Scheme	**Examination Scheme**	
Lectures: 3 Hours/Week	Duration of Paper:	03 Hours
Tutorial: 1 Hour/Week	University Assessment:	80 Marks
	College Assessment:	20 Marks

Course Objectives and Expected Outcomes: This course provides the basic knowledge about Thermodynamic laws and relations, their application to various processes. At the end of this course, student will be able to understand the thermodynamic laws and their applications, the concept of entropy and availability, thermodynamic relations, and shall understand the various thermodynamic processes & cycles.

UNIT – I **[8 Hrs.]**

Introduction to Thermodynamics: Basic concepts of Thermodynamics, Systems and its forms, Property, State, Process, Cycles, Thermodynamics equilibrium, temperature, Zeroth law of thermodynamics, Introduction to First law of thermodynamics, Energy transfer, Heat and Work, Mechanical form of work, Non-mechanical form of work.
Ideal Gas: Gas laws-Boyle's law, Charle's law, Avagadro's law, Equation of state, Specific Heat, Universal gas constant, Constant pressure, Constant volume, Isothermal, Isentropic and Polytropic process on P-V Diagram.
Calculation of Heat transfer, Work done, Change in Internal Energy and Enthalpy.

UNIT – II **[8 Hrs.]**

First law of Thermodynamics for Closed System undergoing a process and cycle (Control Mass System) and Open System (Control Volume System), Steady Flow process apply to Nozzle, Turbine, Compressor, Pump, Boiler, Throttling Device, Heat Exchanger. (Analytical treatment on First law applied to closed and open system is expected).

UNIT – III **[8 Hrs.]**

Second Law of Thermodynamics:- Introduction, Thermal Energy Reservoirs, Kelvin-Plank and Clausius Statements, Heat Engine, Refrigerator, Heat Pump, Perpetual Motion Machine I and II, Carnot Cycle, Thermodynamic Temperature scale.
Entropy: Clausius Inequility, Entropy, Principle of increase of Entropy, Change in Entropy for different Thermodynamics Processes with T-S Diagram, Reversible and Irreversible Processes, Availibility.(Simple analytical treatment is expected)

UNIT – IV **[8 Hrs.]**

Properties of Steam: - Sensible Heat, Latent Heat, Critical State, Triple Point, Wet Steam, Dry Steam, Superheated Steam, Dryness Fraction, Internal Energy of Steam, External Work Done during Evaporation, T-S Diagram, Mollier Chart, Work and Heat Transfer during various

Thermodynamic Processes with steam as working fluid, Determination of Dryness Fraction using various Calorimeter. (Analytical Treatment using steam table and Mollier chart is expected)

UNIT – V **[8 Hrs.]**

Vapour Power Cycle:- Introduction, Vapour Carnot Cycle, Rankine Cycle, Method to increase Thermal Efficiency, Reheat-Rankine Cycle, Regenerative Rankine Cycle with opened and closed feed water heaters.

UNIT – VI **[8 Hrs.]**

Air Standard Cycles: - Otto Cycle, Diesel Cycle, Dual Cycle, Brayton Cycle, Stirling Cycle, Ericsson Cycle (Work done & efficiency analysis is expected)

TEXT BOOKS:

1. Engineering Thermodynamics, P. K. Nag, Tata McGraw-Hill Publications
2. Thermal Engineering, P. L. Ballani, Khanna Publications
3. Engineering Thermodynamics, S.S. Khandare, Charotar Publication House

REFERENCE BOOKS:

1. Thermodynamics and Engineering approach, Yunus A. Cengel, Michael A. Boles, Tata McGraw-Hill Publications
2. Engineering Thermodynamics, D. P. Mishra, Cengage Learning Publications
3. Engineering Thermodynamics, Gordon Rogers, Pearson Publications
4. Thermodynamics, S. C. Gupta, Pearson Publications

PRIYADARSHINI COLLEGE OF ENGINEERING, NAGPUR
(M.S.)

DEPARTMENT OF MECHANICAL ENGINEERING

Certificate

It is to certify that this is a bonafide record of Project Work entitled

"Analysis Of Thermo Acoustic Refrigration By CFD"

Carried out by

354 Shubham Kumar	**358 Vaishnavi Borkar**
337 Ritikesh Wandhare	**406 Harshal Pawade**
445 Shubham Nakade	**443 Dipak Wasoya**

Of 8th Semester

B.E.MECHANICAL ENGINEERING

during the academic year of 2018-19 in partial fulfillment of the requirement for the award of the degree of

BACHELOR OF ENGINEERING

offered by

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR (M.S.)

Prof. P. V. JADHAV
(PROJECT GUIDE)

Prof. S. P. LOKHANDE
(PROJECT COORDINATOR)

Dr. K. S. ZAKIUDDIN
(HEAD OF THE DEPT.)

Dr. M. P. SINGH
(PRINCIPAL)

ABSRTACT

Thermoacoustic refrigeration is a new alternative for cooling that is eco friendly and inexpensive. The construction of a functional model will demonstrate the effectiveness of the new idea for modern cooling. Refrigeration cycle relies on two major thermodynamic principles. First, a fluid's temperature will rise when compressed and will fall when expanded. Second, when two substances are placed in direct contactor each other, heat will flow from the hotter body to the cooler body. While traditional refrigerators use pumps to transfer heat on a large-scale, Thermoacoustic refrigerators depend on sound waves to generate waves of pressure that will alternately expand and compress the gas particles within the tube. The model constructed for this research project employed is inexpensive, household materials. For commercial use there is way more to research and develop in this technology.

In the field of thermoacoustic energy conversion, the application of numerical analysis techniques, specifically computational fluid dynamics (CFD) simulations, have gained ground in recent years. Previous efforts have focused on single thermoacoustic couples that were subjected to the thermoacoustic effect through an oscillatory boundary condition. CFD simulations of an entire thermoacoustic device are computationally expensive and few examples exist. The present work presents an extension of a simulation of a whole thermoacoustic engine that also includes a refrigeration stack. Through interaction of thermally generated sound waves, cooling of the working gas in this stack is demonstrated.

BEME803T3: ELECTIVE-III: RENEWABLE ENERGY SYSTEMS (Theory)

CREDITS: 04

Teaching Scheme	**Examination Scheme**	
Lectures: 3 Hours/Week	Duration of Paper:	03 Hours
Tutorial: 1 Hour/Week	University Assessment:	80 Marks
	College Assessment:	20 Marks

Course Objectives and Expected Outcomes : This course is designed to make the students conversant with the non conventional energy sources and their utilization to harness power. The students will learn the solar energy utilization with its applications. The students will also understand the various methods by which energy can be generated from wind, ocean tides, Geo-thermal phenomenon, Biogas and MHD. At the end of this course, students will appreciate the importance of renewable energy systems & will be able to build them.

UNIT – I **[8 Hrs.]**

Solar Energy: Introduction, solar constant, spectral distribution of solar radiation, beam & diffuse radiation, measurement of solar radiation and measuring instruments. Solar radiation geometry, solar angles, estimation of average solar radiation, radiation on tilted surface, tilt factors, solar fuel cell.

UNIT – II **[8 Hrs.]**

Solar flat plate collectors: Types of collectors, liquid flat plate collectors, solar air heaters, transmissivity of glass cover system, collector efficiency, analysis of flat plate collector, fin efficiency, collector efficiency factor and heat removal factor, selective surfaces, evacuated collectors, novel designs of collector.

UNIT – III **[8 Hrs.]**

Concentric collectors: line focusing, point focusing and non focusing type, central receiver concept of power generations, compound parabolic collector, comparison of flat & concentric collectors. Applications of solar energy to water heating, space heating, space cooling, drying refrigeration, distillation, pumping. Solar furnaces, solar cookers, solar thermal electric conversion, solar photo-voltaics. Solar energy storage, sensible, latent and thermo chemical storage, solar pond.

UNIT – IV **[8 Hrs.]**

Biogas: - Introduction, bio gas generation, fixed dome & floating drum biogas plants, their constructional details, raw material for biogas production, factors affecting generation of biogas and methods of maintaining biogas production, digester design considerations, fuel properties of biogas and utilization of biogas.
Bio Mass :- Introduction, methods of obtaining energy from biomass, Incineration, thermal gasification, classification of gasifiers & constructional details, chemistry of gasification, fuel properties, applications of gasifiers.

UNIT – V **[8 Hrs.]**

Wind and Ocean energy: - Power in wind, forces on blades. Wind energy: Basic principle of wind energy conversion, site selection consideration, wind data and energy estimation. Basic components of WECS classification of WEC systems, Savonius and Darrieus rotors applications of wind energy.

Ocean energy: Introduction, ocean thermal electric conversion, open and closed cycle of OTEC, hybrid cycle, energy from tides, basic principles of tidal power & components of tidal power plants. Single & double basin arrangement, estimation of tidal power and energy.

UNIT – VI **[8 Hrs.]**

Geothermal and MHD power generation:
Geothermal energy: Introduction, classification of geothermal systems, vapour dominated, liquid dominated system, total flow concept, petrothermal systems, magma resources, applications of geothermal operational & environmental problems.
Magneto Hydro Dynamic power generation: Introduction, principles of MHD power generation, MHD open and closed systems, power output from MHD generators.

LIST OF TUTORIALS: Tutorials based on above syllabus.

TEXT BOOKS:

1. Renewable Energy Recourses: Basic Principle and Applications: G.N.Tiwari and M.K. Ghosal, Narosa publication.
2. Non-Conventional Energy Resources: B.H. Khan, Tata McGraw Hill.
3. Solar Energy Utilization, G.D. Rai. Khanna pulishers.
4. Industrial Energy Conservation, D. A. Ray, Pergaman press.

REFERENCE BOOKS:

1. Non-Conventional Energy Sources , G.D. Rai, Khanna publishers.
2. Solar Energy, S.P. Shukhatme, Tata McGraw Hill Education.
3. Renewable Energy Sources and Emerging Tech., Kothari. PHI.

PRIYADARSHINI COLLEGE OF ENGINEERING, NAGPUR (M.S.)

DEPARTMENT OF MECHANICAL ENGINEERING

Certificate

It is to certify that this is a bonafide record of Project Work entitled

"FABRICATION OF A SYSTEM FOR TRANSFORMATION OF PLASTIC WASTES INTO FUELS"

Carried out by

208	VISHAKH R. ULEMALE	266	KRISHNA Kr. SINGH
138	RAJA KUMAR	223	SHREETEJ MALODE
213	HIMANSHU KUMBHARE	225	SUMANT MALODE
250	CHANDRABHUSHAN MAHANKAL		

of 8th Semester

B.E. MECHANICAL ENGINEERING

during the academic year of 2018-19 in partial fulfillment of the requirement for the award of the degree of

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(PROJECT COORDINATOR)

Dr. K. S. ZAKIUDDIN
(HEAD OF THE DEPT.)

Dr. M. P. SINGH
(PRINCIPAL)

ABSTRACT

Scrap is considered one of the very common and significant solid wastes and its production is increasing due to the increase in the number of vehicles in the developed and developing countries. The current economic growth rate is unsustainable without fossil energy savings such as crude oil, natural gas or coal. There are many alternatives to fossil energy such as biomass, hydropower and wind energy. Furthermore, an adequate waste management strategy is another important aspect. Development and modernization have resulted in a huge increase in the production of all types of goods, which indirectly generate waste. Plastic was one of the materials due to their wide range of applications due to its versatility and relatively low costs.

In 2013, approximately 299 million tons of plastic were produced, an increase of 4% compared to 2012. Of these, 6.3 billion were transformed into plastic waste. Only 9% of this waste was recycled and 12% was incinerated. A huge 79% ended up in landfills or in the environment. Every year about 10-20 million tons of plastic end up in the oceans. A recent study has conservatively estimated that 5.25 trillion plastic particles with a total weight of 268.940 tons are currently floating in the world's oceans.

Our project deals with the extraction of OIL/DIESEL from plastic waste called PLASTIC PYROLYZED OIL that can be marketed at much cheaper rates than those on the market. As we know, both fuels derived from plastic and oil are hydrocarbons that contain the elements of carbon and hydrogen. The pyrolysis process becomes an option of waste-to-energy technology to provide biofuel to replace fossil fuel. The advantage of the pyrolysis process is its ability to handle unfiltered and dirty plastic. Pre-treatment of the material is easy. Plastic is needed to be sorted and dried. Pyrolysis is also harmful non-toxic or non-environmental emission unlike incineration.

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering and Technology

B.E. (MECHANICAL ENGINEERING): FOURTH SEMESTER

BEME403T: HYDRAULIC MACHINES (Theory)

CREDITS: 04

Teaching Scheme	**Examination Scheme**	
Lectures: 3 Hours/Week	Duration of Paper:	03 Hours
Tutorial: 1 Hour/Week	University Assessment:	80 Marks
	College Assessment:	20 Marks

Course Objectives and Expected Outcomes: This course includes hydraulic turbines, centrifugal pumps, positive displacement pumps and miscellaneous water lifting devices. At the end of this course, students will understand practical applications of fluid; based on momentum and angular momentum principles involved in hydraulic machines. They will also understand design parameters and performance characteristics of various hydraulic machines & devices.

UNIT – I **[8 Hrs.]**

Compressible Flow:- Speed of Sound and the Mach Number, Isentropic Nozzle Flow, Normal Shock Wave, Shock Wave in Convergent-Divergent Nozzle, Vapour flow through Nozzle, Oblique Shock Wave, Isentropic Expansion. Introduction to impact of jet.

UNIT – II **[8 Hrs.]**

Theory of turbo machines and their classification, Elements of hydro-electric power plant, Impulse Turbine:- principle, constructional features, Installation of Pelton Turbine, Velocity Diagram and Analysis, Working proportions, Design parameters, Performance characteristics, Governing.

UNIT – III **[8 Hrs.]**

Reaction or pressure Turbine:- principles of operation, Degree of reaction, comparison over Pelton Turbine, Development of reaction turbine, Classification, Draft tube, Cavitation in Turbine, Francis Turbine, Propeller Turbine, Kaplan Turbine:- Types, Constructional features, Installations, Velocity Diagram and analysis, Working proportions, Design parameters, Performance characteristics, Governing, selection of turbines.

UNIT – IV **[8 Hrs.]**

Hydrodynamic pumps:- Classification and Applications, Centrifugal pumps:- Principle of operation, Classification, Component of Centrifugal Pump installation, Priming methods, Fundamental equation, Various heads, Velocity heads, Velocity triangles and their analysis, slip factor, Effect of outlet blade angle, Vane shapes, Losses and Efficiencies of pumps, Multi staging of pumps, Design Consideration, Working proportions, N.P.S.H., Cavitations in pumps, Installation and operation, Performance characteristics, Pump and system matching and Introduction to self priming pumps.

UNIT – V **[8 Hrs.]**

Positive Displacement Pumps:- Basic principle, Classification, Reciprocating Piston / Plunger Pumps:- Types, Main Components, Slip, Work Done, Indicator Diagram, Cavitations, Air vessels, Gear pump, Screw pump, Vane pump.

UNIT – VI **[8 Hrs.]**

Similitude: - Types of similarities, Dimensionless number and their significance, Unit and Specific Quantities, Model Testing: - Application to hydraulic turbine and hydrodynamic pumps, Miscellaneous Water Lifting Device: - Air lift pumps, Hydraulic Ram, Submersible pump, Regenerative pumps.

LIST OF TUTORIALS:

1) Selection of Turbine
2) Design of centrifugal Pumps
3) Design of Francis Turbine
4) Design of reciprocating Pumps
5) Governing of Turbines
6) Study of Hydro-Kinetic System

TEXT BOOKS:

1. Fluid Mechanics & Fluid Power Engineering – D. S. Kumar, S.K. Kataria & Sons Publications
2. Fluid Mechanics & Machines – R. K. Bansal, Laxmi Publications

REFERENCE BOOKS:

1. Fluid Mechanics with Engineering Applications, E. Finnemore & Franzini, Tata Mc-Graw Hill
2. Hydraulic Machines-Theory and Design, V. P. Vasandani, Khanna Publishers
3. Fluid Mechanics, A. K. Jain, Khanna Publishers
4. Hydraulic & Compressible Flow Turbo-machines, A. T. Sayers, Mc-Graw Hill
5. Mechanics of Fluids, Merle C. Potter, CL-Engineering
6. Fluid Mechanics, John F. Douglas, Pearson

Priyadarshini College of Engineering, Nagpur Department of Mechanical Engineering

This is to certify that this is a bona-fide record of project work entitled

FREE ENERGY GENERATION USING CAROUSEL

carried out by

1) DIVYA SONAWANE
2) SANDIP MAHATO
3) SUPRIYA DHORE
4) MOHAMMED DANISH HASSAN
5) Md. ASHFAQUE JAMAL
6) SHUBHAM KAKDE
7) PAWAN PATEL

of the B.E., Department of Mechanical Engineering, during the academic year 2018- 2019, in the partial fulfillment of the requirement for the award of the degree of Bachelor of Engineering (Mechanical Engineering) offered by the Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur.

Prof. SAGAR D. SHELARE
Guide

Prof. SATISH P. LOKHANDE
Project Incharge

Dr. K.S. Zakiuddin
Professor & Head of Department

Professor & Head
Department of Mechanical Engg
Priyadarshini College of Engg
Nagpur-19

Dr. M. P. Singh
Principal

ABSTRACT

In today's world need for an ultimate source of energy is limited. The idea of a Carousel, a water pump and electricity generator powered by a children's roundabout, designed for use in the developing world. The Carousel is analyzed as an example of 'design for development', an area of current design attention to the developing world, and also as an example of objects that combine instrumental functions for the user, with communication to audiences.

Carousel is examined using a framework constructed from the analysis of similarly communicative, multifunctional objects taken from other disciplines and contexts. These disciplines and contexts are: the appropriate technology 'movement', which is an ancestor to and influence upon design for development; interventionist art; critical design; and activist practices in the developing world. Through these combined perspectives, the Carousel is revealed as an object that priorities free energy generation. Thus an idea of free energy generation by carousel is something that is high in demand. Energy is a kind of resource that is required by every individual in today's era. This project intends to generate free electricity and to lift water on required height by cyclic rotation of carouse

The working of this project is based on conversion of mechanical energy into electrical energy as well as the belt mechanism that is been employed in the project helps in uplifting water.

In conclusion, the arguments produced around the Carousel's prioritizing of first world audiences over developing world users are applied to the broader field of design for development, identifying the risks in its ways of operating. In closing, a broader view of 'objects in development' is proposed, suggesting that objects which act for users and communicate to audiences should be analyzed with the same multidisciplinary gaze brought to the analysis of the Carousel.

This approach of free energy generation can be implemented in areas where problem of electricity generation persists. This project of free energy generation using carousel is analyzed as an example of design for development and for better and effortless survival. The purpose of this project is generation of free electricity using carousel.

This Carousel will pay attention to customer needs and will attribute for children playing on it as well as adults for power absorption.

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering and Technology

B.E. (MECHANICAL ENGINEERING): SEVENTH SEMESTER

BEME703T: COMPUTER AIDED DESIGN (Theory)

CREDITS: 04

Teaching Scheme	**Examination Scheme**	
Lectures: 3 Hours/Week	Duration of Paper:	03 Hours
Tutorial: 1 Hour/Week	University Assessment:	80 Marks
	College Assessment:	20 Marks

Course Objectives and Expected Outcomes: This course is aimed to develop; a framework where the designer works with computer to develop an Engineering system, CAD system that leads to effective use of computers in the entire design process, computer graphics & procedure about the geometrical modeling of engineering objects, controls on modeling parameter and graphics visualization techniques using computer. Further application of numerical method (FEA) for the analysis of mechanical elements is also included. At the end of this course, student will appreciate the importance of computers, computer graphics & numerical methods and will be able to use them for modeling, designing & analysis of mechanical components.

UNIT – I **[8 Hrs.]**

Introduction of CAD, Difference between Conventional & CAD design, Rasterisation techniques frame buffer, N-bit plane buffers, Simple color frame buffer algorithm for the generation of basic geometric entities like line, circle & ellipse by using parametric & non-parametric equations.

UNIT – II **[8 Hrs.]**

Introduction to windowing & clipping (excluding algorithm), Window and Viewport, line clipping & polygon clipping

2D transformation: Translation, Scaling, Rotation, Reflection & Shear, Concept of homogeneous representation & concatenation. Inverse Transformation (enumeration of entity on graph paper)

3D Transformation ; Translation, Scaling, Rotation, Reflection etc.

UNIT – III **[8 Hrs.]**

Techniques for Geometric Modeling:
Graphic standards, parametric representation of geometry, Bezier curves, Cubic spline curves, B-Spline curves, constructive solid geometry, Feature Based modeling, Feature recognition, Design by feature, Wire frame modeling, solid modeling of basic entities like box, cone, cylinder. CSG & B- representation technique using set theory.

Assembly modeling: Representation, mating conditions, representation schemes, generation of assembly sequences and importance of precedence diagram.

UNIT – IV **[8 Hrs.]**

Finite Element Analysis:
One Dimensional Problem: Fundamental concept of finite element method, Plain stress and strain, Finite Element Modeling, Potential Energy Approach, Galerkin Approach, Coordinate and Shape function, Assembly of Global Stiffness Matrix and Load Vector, Properties of Stiffness Matrix, Finite Element Equations, Quadratic Shape Function, Temperature Effects, Torsion of a circular shaft.

UNIT – V **[8 Hrs.]**

Truss & Two Dimensional FEM:
Plane truss problems, two dimensional problems using Constant strain triangle. Derivation of shape functions for CST element. Formulation of stiffness matrices for Truss and CST element. Preprocessing and Post processing.

UNIT – VI **[8 Hrs.]**

Optimization in Design:
Objectives of optimum design, adequate and optimum design, Johnson's Method of optimum design, primary design equation, subsidiary design equations and limit equations, optimum design with normal and redundant specifications of simple machine elements like: tension bar, transmission shaft and helical spring.

LIST OF TUTORIALS: (at least Six)

1) Introduction to CAD softwares and DDA algorithm for Line generation.
2) Algorithm, flow chart and C-Program for Bressenham's Line generation
3) Algorithm, flow chart and C-Program for Bressenham's Circle generation
4) Algorithm, flow chart and C-Program for Bressenham's Ellipse generation or Ellipse generation using parametric equations.
5) Algorithm, flow chart and C-Program for Bezier Curve generation.
6) Two examples of two dimensional transformations.
7) Two examples on three dimensional transformations.
8) FE problems using one dimensional element (bar, temperature effect, torsion).
9) FE problems using plane truss element.
10) FE problems on two dimensional CST element.
11) Two numerical on optimization.

TEXT BOOKS:

1. CAD/CAM Theory and Practice, Zeid Ibrham, Tata McGraw Hill.
2. CAD/CAM, Principles and Applications, P.N. Rao, McGraw Hill.
3. Computer Aided design and Manufacturing, Lalit Narayan, Rao & Sarcar, PHI pub.
4. Introduction to Finite Elements in Engineering, Chandrupatla T. R. and Belegunda A.D., Prentice Hall India.
5. Finite Element Method with application in Engineering, Y.M. Desai, T.I. Eldho, A.H. Shah, Pearson publication.
6. Optimization: Theory and Practice, Joshi M.C, Narosa Publication.

REFERENCE BOOKS:

1. Computer Graphics, D. Hearn & M.P. Baker, Pearson.
2. Computer Graphics, S. Harrington, McGraw Hill.
3. Computer Control of Manufacturing Systems, Yoram Koren, McGraw Hill.

PRIYADARSHINI COLLEGE OF ENGINEERING, NAGPUR
(M.S.)
DEPARTMENT OF MECHANICAL ENGINEERING

Certificate

It is to certify that this is a bonafide record of Project Work entitled

"DESIGN AND DEVELOPMENT OF STAIR-LIFT"

Carried out by

(212) Gunjan C. Bokade
(222) Nogendra S. Bhisikar
(144) Saurabh S. Winchurne
(147) Shubham S. Fulzele
(206) Soham D. Rakhade
(154) Vaibhav P. Shahare
(227) Yash S. Tumane

of 8th Semester
B.E.MECHANICAL ENGINEERING
during the academic year of 2018-19 in partial fulfillment
of the requirement for the award of the degree of
BACHELOR OF ENGINEERING
offered by

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR (M.S.)

Dr. Prof. K. S. ZAKIUDDIN
(PROJECT GUIDE)

Prof. S. P. LOKHANDE
(PROJECT COORDINATOR)

Dr. Prof. K. S. ZAKIUDDIN
(HEAD OF THE DEPT.)

Dr. M. P. SINGH
(PRINCIPAL)

ABSTRACT

The urbanization started some 2 to 3 decades ago and has taken much of the City limits to get compressed nearest to the amenities which resulted in high rise. Most residential buildings were granted the permission to build up to Ground plus 2 or 3 storied, wherein Elevator was not installed Since at that time, it was not considered necessary and people preferred to climb stairs, irrespective of all odds. Consequent to the Life-Style changes, including physical and mental apathy, currently the four storey building residents have started to feel need for having a Elevator in their buildings. But now many factors abide them such as local body governing rules for town planning, constructional requirement and cost of installation of the Elevator. In these old buildings that do not have elevators or consist of two floors or more must have a device for transportation.

The need of this project is very wide and confines to develop a mobility-aiding device Staircase Stairlift is a mechanism for home lifting aid that will allow an individual to slide over the staircase as well as can utilize the same staircase for pedestrian purpose also. Staircase Stairlift mechanism should get installed at the stock of the staircase with minimum stalk civil alteration. The device must be smooth, powerful, safe and stable, along with ease of installation and economic.

In this project work, we used conventional method as well as CAD software i.e. CATIAV5 for designing staircase Stairlift mechanism parts and assembly. Then analysis of design was performed on FEA software. After final analysis, when results were found to be safe, design was finalized and the working set up was fabricated and working satisfactorily as per the design.

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering and Technology

B.E. (MECHANICAL ENGINEERING): FOURTH SEMESTER

BEME404T: MACHINING PROCESSES (Theory)

CREDITS: 04

Teaching Scheme
Lectures: 3 Hours/Week
Tutorial: 1 Hour/Week

Examination Scheme
Duration of Paper: 03 Hours
University Assessment: 80 Marks
College Assessment: 20 Marks

Course Objectives and Expected Outcomes: The study of machine tools & metal cutting is fundamental to mechanical engineering. This course includes the working of mechanisms of various machine tools and machining principles. The learning outcomes includes concept of theory of metal cutting & force analysis, understanding the objectives of the various machine tools, constructional details and mechanisms involved in various machine tools. This course is aimed also to identify the machining parameters, different types of cutting tool materials, cutting fluids and their properties. Upon completion of this course, students shall understand the importance of machining processes and be able to apply the suitable machining processes for an engineering product.

UNIT – I **[8 Hrs.]**

Introduction to Machining Parameters: Introduction to machining, Tool materials, nomenclature and tool geometry of single point cutting tool, tool materials properties, classification, HSS, carbide tool, coated tools, diamond coated tool.
Theory of Metal Cutting: Introduction. Orthogonal and Oblique cutting. Mechanics of Metal Cutting, shear plane, Stress, Strain and cutting forces. Merchant's circle, Chip formation, cutting force calculations, Determination of Torque and power required for turning Drilling and Milling. Influence of tool angle, cutting fluids, cutting speed, feed and depth of cut on power requirement, Estimation of tool life.

UNIT – II **[8 Hrs.]**

Lathe: Introduction. type, construction of simple lathe mechanism and attachments for various operations, machine specifications, basis for selection of cutting speed. feed and depth of cut, time estimation for turning operations such as facing, step turning, taper turning, threading, knurling.
Introduction to Capstan & Turret Lathe.

UNIT – III **[8 Hrs.]**

Shaper: Introduction, type, specification, description of machines, hydraulic drives in shapers, cutting parameters. Mechanism of shaper: Quick return mechanism, Crank & slotted link mechanism, Table feed mechanism, attachments for shaper, work holding devices, shaper operations, time estimation for shaping operations.
Slotter : Introduction, specifications, description, type of drives for slotter, types of slotting machines -production slotter, puncher slotter, tool room slotter, slotter tools. Planer: Introduction, specifications, description. type of planner, open side planner, pit planner Mechanism for planner: Driving mechanism, feeding mechanism, planner cutting tools, cutting parameters.

UNIT – IV **[8 Hrs.]**

Milling: Introduction. Specification, types, column & knee type milling machine, fixed bed type milling machines, production milling machines, special purpose milling machines such as thread milling Machines, profile milling machine, Gear Milling/Hobbing machines. Mechanisms & Attachments for Milling. Cutting, parameters, Types of milling operations, Types of milling cutters, Tool geometry & their specifications. Indexing- simple, compound and differential.

UNIT – V **[8 Hrs.]**

Grinding operations, grinding wheel, specifications & selection, cylindrical & centreless grinding operation, surface grinding, tool & cutter grinding, time estimation for grinding operations. Super finishing process: Honing, Lapping, super finishing, polishing, buffing, 'metal spraying, galvanizing and electroplating. Process parameters and attainable grades of surface finish, surface measurement.

UNIT – VI **[8 Hrs.]**

Drilling: introduction, tools for drilling, classification of drills, twist drills, drill size and specifications, tipped drills, type of drilling machines-portable drilling machine. bench drilling machine, right drilling machine, radial drilling machine, universal drilling machine, multisided drilling machine. Drilling machines operations, time estimation for drilling. Reaming: Introduction, description of reamer, type of reaming operations. Boring: Introduction, types of boring machine, horizontal boring machine, vertical boring machine, jig machine, micro boring. boring operations. Broaching: Introduction, type of broaches, nomenclature of broaches. types of broaching machines.

TEXT BOOKS:

1. Workshop technology (Vol. II), V. S. Raghuwanshi, Dhanpat Rai & Sons
2. Manufacturing Science, Ghosh & Mallik, East West Press
3. Manufacturing technology (Metal cutting & Machine tools) Vol. II, P. N. Rao, Tata Mc-Graw Hill
4. Workshop technology, H. S. Bawa, Tata Mc-Graw Hill
5. Introduction to Manufacturing Processes, J. A. Schey, Tata Mc-Graw Hill
6. Workshop Technology (Volume II), Hajra Chaudhary, Media Promoters & Publishers

REFERENCE BOOKS:

1. Manufacturing Engineering & Technology, S. Kalpakjian & S.R. Schmid
2. Technology of Machine Tools, Krar & Oswald
3. Manufacturing Processes, M. Begman
4. Processes & Materials of Manufacture, R. Lindberg
5. Production Technology, HMT

PRIYADARSHINI COLLEGE OF ENGINEERING, NAGPUR (M.S.)

DEPARTMENT OF MECHANICAL ENGINEERING

Certificate

It is to certify that this is a bonafide record of Project Work entitled

"360° FLEXIBLE MULTIHEAD DRILLING MACHINE"

Carried out by

247	**Anubhav Srivastava**	107	**Akshay Patil**
120	**Dnyanesh Hawelikar**	128	**Kaustubh Bondane**
228	**Abhijit Karatundil**	219	**Tushar Thote**

Of 8th Semester

B.E.MECHANICAL ENGINEERING

During the academic year of 2018-19 in partial fulfillment of the requirement for the award of the degree of

BACHELOR OF ENGINEERING

Offered by

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR (M.S.)

02/05/2019.

Prof. M.S.Matey
(PROJECT GUIDE)

Prof. S. P. LOKHANDE
(PROJECT COORDINATOR)

Dr. K. S. ZAKIUDDIN
(HEAD OF THE DEPT.)

Dr. M. P. SINGH
(PRINCIPAL)

ABSTRACT

In previous drilling machines there were many problems arising during drilling operations. Some were because of the parts cannot drill due to small work space between drill bit and the work piece. So we use hand drills to overcome this but it causes alignment problems. So here I propose a 360 degree flexible drill that can be mounted on a table or wall and can be used to drill holes horizontally, vertically or even upside down. This makes it possible to drill easily in even complicated parts and surfaces.

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering and Technology

B.E. (MECHANICAL ENGINEERING): SEVENTH SEMESTER

BEME705T: DESIGN OF MECHANICAL DRIVES (Theory)

CREDITS: 04

Teaching Scheme	**Examination Scheme**	
Lectures: 3 Hours/Week	Duration of Paper:	03 Hours
Tutorial: 1 Hour/Week	University Assessment:	80 Marks
	College Assessment:	20 Marks

Course Objectives and Expected Outcomes: This course is aimed to make the students conversant with design principles & design procedure of mechanical drives like coupling, flywheel, belt drive, chain drive, gear drive, wire rope etc. Design of journal bearing, IC engine components & selection of antifriction bearings is also included. At the end of this course, student will be able to select and design appropriate mechanical drive/s.

UNIT – I **[12 Hrs.]**

Design of Coupling: Types of shaft coupling, design of flange coupling, flexible bush coupling.

Design of Flywheel: Functions, Coefficient of fluctuation of energy and Coefficient of fluctuation of speed, energy storage in flywheel, stresses in flywheel, design of flywheel.

Design of Bearings: Lubrication, Types of Lubrication, oil seals, design of hydrodynamic journal bearings for radial loads, selection of ball and roller bearing for radial and thrust loads. Failures of antifriction bearing, bearing housing.

UNIT – II **[12 Hrs.]**

Design of Flat belt drive: Types of belts & belt material, analysis of belt tension, condition for transmitting maximum power, design of flat belt, flat belt pulley.

Design of V belt drive: Types of V-belt, analysis of V-belt tension, design of V belt & pulley.

Design of Roller chain drive: Velocity ratio and length of chain, design of chain, dimensions of tooth profile, design of sprocket.

Design of wire rope drive: Introduction to wire rope, stresses in hoisting wire rope. Design of wire rope, sheave and drum.

UNIT – III **[12Hrs.]**

Design of Gears: Review of kinematics of gears & terminology, interference, tooth profiles, formative number of teeth etc. Design of Spur Gear drive, Helical Gear drive.

Design of Bevel Gear Drive: Types of bevel gear, proportions of bevel gear, force analysis of bevel gear drive, design of bevel gear drive.

UNIT – IV **[12Hrs.]**

Design of Worm Gear Drive: Worm Gearing—AGMA Equation; Worm-Gear force analysis Designing a Worm-Gear Mesh; Buckingham Wear Load.

Design of I. C. Engine components, Introduction to selection of material for I. C. engine components, Design of cylinder and cylinder head, design of piston and piston-pins, piston rings.

LIST OF TUTORIALS: Tutorials based on above syllabus.

TEXT BOOKS:

1. Machine Design, Maleev & Hartman, CBS publishers.
2. Machine Design, P.H. Black, TMH.
3. Mechanical Engg. Design, Shigley, TMH.
4. Design Data book, B.D. Shiwalkar, Central Techno publications.
5. Design data book for engine parts, Khandare, Kale, Akshaya publications, Nagpur.
6. Design of Machine Elements, V. B. Bhandari., McGraw Hill education.
7. Design of Machine Elements, B.D. Shiwalkar. Central Techno publications.
8. Elements of Machine Design, Pandya N. C. and Shah C. S., Charoter publishing.
9. Mechanical Design Analysis, M. F. Spotts, Prentice-Hall.
10. Design of Machine Elements, Sharma & Purohit, PHI.
11. Machine Component Design, Robert C. Juvinall, Kurt M. Marshele, Wiley.
12. Design Data Hand Book, Mahadevan, CBS publishers.
13. Design Data Book, PSG.

REFERENCE BOOKS:

1. Hand book of Machine Design, Shigley & Mischke, McGraw Hill.
2. Mechanical Engineering Hand book Vol 1 & 2, Kent, John Willey & Sons.
3. Machine Tool Design Data Book, CMTI.
4. Engineering Design, Dieter G E., McGraw Hill education.
5. Machine Design, Robert L.Norton, Pearson.

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PRIYADARSHINI COLLEGE OF ENGINEERING, NAGPUR (M.S.)

DEPARTMENT OF MECHANICAL ENGINEERING

Certificate

It is to certify that this is a bonafide record of Project Work entitled

"DESIGN & APPROACH TO FABRICATION OF A SET UP FOR VALIDATING PATENTON ELIMNATION OF FLYWHEEL BY PROPER IMPLIMENTATI ON OF POWER ELECTRONIC BETWEEN SUPPLY TERMINAL AND MOTOR TERMINAL (ONLY MECHANICAL SYSTEM DESIGN)"

Carried out by

111 Aniket .V. Junghare	**131 Nishant .Y. Rahangdale**
151 Swapnil .K. Dhapodkar	**148 Sidharth Jivtode**
160 Yugal .I. Sonkusare	**156 Vatan Meshram**

204 Santosh Thakre

of 8th Semester

B.E.MECHANICAL ENGINEERING

during the academic year of 2018-19 in partial fulfillment of the requirement for the award of the degree of

BACHELOR OF ENGINEERING

offered by

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR (M.S.)

Dr. M.S. Giripunje
(PROJECT GUIDE)

Prof. S. P. LOKHANDE
(PROJECT COORDINATOR)

Dr. K. S. ZAKIUDDIN
(HEAD OF THE DEPT.)

Dr. M. P. SINGH
(PRINCIPAL)

ABSTRACT

The project aims at designing and approach to fabrication of a set up for eliminating the flywheel and replacing it with the electronic circuit. The projects aims at developing of a system to store the energy but not using the flywheel, but by using an electronic circuit. Now a days the most common method to store the energy is to use a flywheel but the major disadvantage is that it occupies more space and is less accurate. One of the idea to overcome this problem is to replacethe flywheel by an electronic circuit.

Electronic circuits are fast, can be programmed for various speeds, are more accurate and occupy less space as compared to any other mechanical component. Thus replacing a flywheel with such a circuit will not only give good result but will also make the system compact and cost efficient.

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering and Technology

B.E. (MECHANICAL ENGINEERING): SIXTH SEMESTER

BEME605T: DYNAMICS OF MACHINES (Theory)

CREDITS: 04

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hours/Week	Duration of Paper: 03 Hours
Tutorial: 1 Hour/Week	University Assessment: 80 Marks
	College Assessment: 20 Marks

Course Objectives and Expected Outcomes: This course is designed to understand the method of dynamic force analysis of machinery, the concept of vibratory systems and their analysis and also to study the effect of undesirable effects of unbalances in rotors and engines.

UNIT – I [8 Hrs.]

Concepts in machine element dynamics. D'Alembert principle. Application of these approaches for simple two degree of freedom systems. Simple precession and gyroscopic couple. Gyroscopic effect on airplane, ship, vehicles and grinding mills.

UNIT – II [8 Hrs.]

Dynamic force analysis of planar linkages such as four bar chain and reciprocating mechanism by graphical method, virtual work method. Cam dynamics and jump-off phenomenon.

UNIT – III [8 Hrs.]

Static & Dynamic balancing in rotating machines. Balancing machines and field balancing by vector diagram.
Balancing in reciprocating mechanism.

UNIT – IV [8 Hrs.]

Turning moment Vs crank angle diagram for single- cylinder and multiple-cylinder engines, punching machines etc. Flywheel selection.
Speed governors, centrifugal and inertia type, Watt, Portal, Proel, Hartnell governors, operating characteristics of governors.

UNIT – V [8 Hrs.]

Derivation of equation of motion for vibratory system. Free vibration of single-degree-of-freedom system with and without damping. Logarithmic decrement and damping estimation. Forced vibration of single-degree-of-freedom system and vibration isolation, whirling of shaft and critical speed of rotors.

UNIT – VI [8 Hrs.]

Equation of motion for two-degree-of-freedom system. Natural frequencies and mode shapes, vibration absorber. Torsional oscillation of two-disc and three disc rotors. Introduction to FFT analyzer for vibration measurements.

TEXT BOOKS:

1. Mechanical Vibrations, S. S. Rao, Addison Wesley Publishing.
2. Mechanical Vibrations, V. P. Singh, Dhanpat Rai & Sons.
3. Mechanical Vibrations, G. K. Grover, Nem Chand & Bros.
4. Fundamentals of Mechanical Vibration, Graham Kelly, Tata McGraw Hill.
5. Theory of Machines, Jagdish Lal, Metropolitan Publishers.
6. Theory of Machines, Rattan S. S, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
7. Vibration and Noise for Engineering, Pujara, K, Dhanpat Rai and Company.
8. Theory of Machine, Thomas Bevan, Pearson Publications.
9. Mechanics of Machines, V. Ramamurti, Narosa Publications.
10. Mechanism & Machine Theory, A.G. Ambekar, PHI Publication.

REFERENCE BOOKS:

1. Theory of Mechanisms and Machines, Ghosh A. and Mallick A.K., Affiliated East-West Press Pvt. Ltd., New Delhi, 1988.
2. Theory of Machines and Mechanisms, Shigley J.E. and Uicker J.J.,McGraw-Hill, Inc., 1995.
3. Mechanism and Machine Theory, Rao J.S. and Dukkipati R.V., Wiley-Eastern Limited, New Delhi, 1992.
4. Mechanics of Machines, John Hannah and Stephens R.C., Viva Books.
5. Theory of Machines, Sadhu Singh, Pearson Education.

PRIYADARSHINI COLLEGE OF ENGINEERING, NAGPUR (M.S.)

DEPARTMENT OF MECHANICAL ENGINEERING

Certificate

It is to certify that this is a bonafide record of Project Work entitled

""DESIGN AND FABRICATION OF PEDAL OPERATED CORN SHELLER MACHINE"

334	RAJAT R. DHANVIJAY	338	ROBIN SINGH RAWAT
323	NIKHIL P. CHOUDHARI	336	RAKESH R. KATRE
327	PRAJAWAL H.KHOBRAGADE	333	PRITESH S. DONGARE

Carried out by

Of 8th Semester

B.E.MECHANICAL ENGINEERING

During the academic year of 2018-19 in partial fulfillment of the requirement for the award of the degree of

BACHELOR OF ENGINEERING

Offered by

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR (M.S.)

Prof. H. K. DUBEY
(PROJECT GUIDE)

Prof. J. M. LANJEWAR
(PROJECT CO-GUIDE)

Prof. S. P. LOKHANDE
(PROJECT COORDINATOR)

Dr. K. S. ZAKIUDDIN
(HEAD OF THE DEPT.)

Dr. M. P. SINGH
(PRINCIPAL)

ABSTRACT

As we all know maize is one of the most important element of our food. But we don't know, how maize is shell. Deseeding and shelling are important operation in maize, mainly it is done by women's using small tools or cloth. These operation involve a lot of labour as these are done manually. The maize shelling with the tool is difficult process and produces very low output. Besides, Deseeding as a separate activity leads shelling that brings additional burden on farmers. They may hire labourers or use machines. But the automated machines are expensive for the farmers in village. The farmers find it difficult to afford the machines. In order to make it affordable and more convenient to shell the maize, and as the project is part of our academics, we have design and development of "PEDAL OPERATED CORN SHELLER MACHINE" using ergonomic and mechanical aspects for deseeding and shelling. It consists of feeder from where the maize is inserted. The pedal is connected with the spike plate with the help of chain drive. When the pedal is pushed the spike plate rotates and guide plate getting the way out for maize and shelling the maize. The machine is operated by 1 person and only one maize is shelled at a time.