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,
email : principal.pce.ngp@gmail.com, www.pcenagpur.edu.in

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

2017-18

PRIYADARSHINI COLLEGE
OF ENGG. NAGPUR
CERTIFIED DOCUMENT
Page 2 to 33
Principal

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**	**12**
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**
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**	**24, 20, 28, 16, 8**
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 – I: Power Plant Engineering	BEME702T4		
40	Elective – III: Renewable Energy Systems	BEME803T3		
41	Elective III-Design of Hydraulic And Pneumatic System	PGMED204T		
42	Industrial Visit	BEME507P	**Other**	
43	Industrial Case Study	BEME608P		
44	Mini Project	BEME407P		
45	Project Seminar	BEME706		
46	Project Seminar	PGMED303P		
47	Project	BEME806P		
48	Project	PGMED401P		
49	Control Systems Engineering	BEME602T		
50	Computer Applications – I	BEME506T		
51	Mechatronics	BEME604T/P		
52	Functional English	BEME606T		
53	Computer Applications – II	BEME607P		
54	Technical Report and Seminar	BEME307P		
55	Environmental Studies	BEME406T		

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

CERTIFICATE

Priyadarshini College of Engineering, Nagpur
Department of Mechanical Engineering

This is to certify that this is a bonafide record of project work entitled **Design And Fabrication of Abrasive Flow Machining** carried out by **Rishab Sharma (250)** of the B.E., Department of Mechanical Engineering, during the academic year 2017-2018, in the partial fulfillment of the requirement for the award of the degree of Bachelor of Engineering (Mechanical Engineering) offered by the Rashtrasant Tukadoj Maharaj Nagpur University, Nagpur.

Prof.Dr. C. N. Sakhale
Guide

Dr. C. N. Sakhale
Project Incharge

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

Dr. M. P. Singh
Principal

ABSTRACT

Abrasive flow machining (AFM) is a non-traditional finishing process used to deburr, chamfer, polish, remove recast layers, and to produce compressive residual stress. AFM can be mostly used to polish and deburr internal parts, through holes, intersecting holes and freeform surfaces which are difficult to finish with other traditional finishing processes. It can be a high potential candidate in the simultaneous finishing of the workpiece, instead of separately finishing of internal and external surfaces of the workpiece with other non-conventional processes.

The present research initiatives are based on the simultaneous finishing of the ring-shaped cylindrical aluminum alloy workpiece. A pneumatic system is used for actuation of the media piston in the present work. The present study initiatives identify the process parameters such abrasive mesh size, concentration of abrasives in media and number of passes that significantly affect the change in surface roughness of the inner surfaces and the amount of material removal. The silicon carbide abrasive media has been prepared. The parameters selected for the present study is abrasive mesh size, concentration of abrasives in media and number of passes at three level each. Work material, abrasive type, working temperature, media, media flow per pass. It has been observed from an experimental investigation that the abrasive mesh size, concentration of abrasives in media and number of passes have a significant effect on both changes in surface roughness and material removal. The percentage improvement in surface roughness of the internal of the ring-shapedworkpiece are observed in this study are 35, 37 and 27% respectively. The main objective of the simultaneous finishing is achieved by the specially designed fixture and the same objective may be applied for simultaneous finishing of the workpiece, specifically deep groove ball bearing in one go instead of separately finishing of internal surfaces with traditional finishing processes.

BEME802T5: ELECTIVE – II: REFRIGERATION AND AIRCONDITIONING (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 understand the basic concept of refrigeration and air conditioning. Students will be able to understand the non conventional refrigeration system and cryogenics through the knowledge of air conditioning which includes psychometric, heat load calculations, design of air conditioning system & transmission and distribution of conditioned air. This will also enhance their knowledge about environmental impact of refrigerants and alternative refrigerants. At the end of the course, students will be conversant with domestic, commercial and industrial applications of refrigeration and air conditioning.

UNIT – I **[8 Hrs.]**

Refrigeration: Introduction, unit of refrigeration, analysis of simple vapour compression refrigeration system, effect of sub cooling, superheating on coefficient of performance.
Study of Vapour Absorption Refrigeration System: Aqua Ammonia, Lithium Bromide- Water system, Refrigerants – Properties, classification, nomenclature, its global warming & ozone depletion potential, montreal protocol, kyoto protocol, alternate refrigerants.

UNIT – II **[8 Hrs.]**

Compound Vapour Compression Refrigeration system and multiple evaporator system:- Compound vapour compression refrigeration system, multiple evaporator system, types of compressor, condenser, evaporator, expansion devices, hermatic compressors, methods of defrosting. Refrigeration controls.

UNIT – III **[8 Hrs.]**

Air cycle refrigeration:
Air cycle refrigeration & its application, types of air refrigeration system, vortex tube, thermoelectric refrigeration, steam jet refrigeration. (Analytical treatment is expected on air refrigeration system).

UNIT – IV **[8 Hrs.]**

Cryogenics: Introduction, application of cryogenics, cascade system, Joules Thomson coefficient, inversion curve, methods of liquefaction of air with analytical treatment.

UNIT – V **[8 Hrs.]**

Advanced Psychometric & Heat Load Calculations:
Introduction to psychometric properties and processes of air. Classification of air conditioning systems, Applications of psychometry to various air conditioning systems, RSHF, ESHF, GSHF, air washers, air coolers.

Heat Load Calculations: Data collection for load calculation, various components of heat load, heat load estimate, cooling load calculations.

UNIT – VI **[8 Hrs.]**

Air Transmission & Distribution: Principle of air distribution, types of grilles & diffusers & their selection criteria, air filtration, types of air filters, distribution of air through ducts, pressure losses in ducts, methods of duct design, duct friction chart, air conditioning controls.

LIST OF TUTORIALS: Tutorials based on above syllabus.

TEXT BOOKS:

1. Refrigeration & Air conditioning, Stocker & Jones, McGraw Hill Publication.
2. Refrigeration and Air Conditioning, S.N. Sapali, PHI.
3. Refrigeration and Air Conditioning, R.S.Khurmi, S.Chand and Company.
4. Refrigeration and Air Conditioning, Arora and Domkundwar, Dhanpat Rai and Sons.
5. Refrigeration and Air Conditioning, Arora C P, Tata McGraw Hill.

REFERENCE BOOKS:

1. Principles of Refrigeration, Roy Dossat, Pearson Education.
2. Commercial Refrigeration, Edwin P. Anderson, Taraporevala Sons & Co.
3. ASHRAE Hand Books, Air Conditioning Engineers.
4. Handbook of Refrigeration and Air Conditioning, Shan Wang, McGraw Hill Publications.
5. Refrigeration and Air Conditioning, P.N. Ananthnarayan, Tata McGraw Hill.
6. Air Conditioning Principle and System, PITA, PHI publication.

Priyadarshini College of Engineering, Nagpur
Department of Mechanical Engineering

This is to certify that this is a bonafide record of project work entitled **Design and Fabrication Of Suction Duct For Cotton Ginning** carried out by Sanket Kalbande, Sarthak Umale, Nayan Ninawe, Shubham Gurharikar, Ajinkya Sontakke, Rajas Savdekar of the Bachelor of Engineering, Department of Mechanical Engineering, during the academic year 2017-2018, 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.

A.S. Nilewar
Guide

Dr. C. N. Sakhale
Associate Professor & Project Incharge
Department of Mechanical Engineering
Priyadarshini College of Engineering Nagpur

Dr. K.S. [illegible]kiuddin
Professor & Head of Department
Department of Mechanical Engineering
Priyadarshini College of Engineering
Nagpur

Dr. M. P. Singh
Principal
Priyadarshini College of Engineering Nagpur

ABSTRACT

Ginning is a process of separation of cotton lint from cotton seed. At max of the ginning centre, double roller cotton gin is used for this purpose. Before actual ginning process, cottonseed is transferred from heap to pre-cleaner to clean the cottonseed. For this purpose, conveyor belt is used. It is observed that motor running the conveyor belt oftenly breaks down because of jamming of cotton particles in conveyor motor.

Hence an alternative is provided for conveyor belt system. A sheetmetal duct is designed and fabricated to transfer cottonseed from cottonseed heap to pre-cleaner which will avoid system break down.

Key Words: Cottonseed, ginning, sheetmetal duct

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering and Technology

B.E. (MECHANICAL ENGINEERING): THIRD SEMESTER

BEME302T: KINEMATICS OF MACHINE (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: The study of kinematics is concerned with understanding of relationships between the geometry and the motions of the parts of a machine. The overall objective of this course is to learn how to analyze the motions of mechanisms, design mechanisms to give desired motions. This course includes relative motion analysis, design of gears, gear trains, cams and linkages, graphical and analytical analysis of position, velocity and acceleration, clutches, brakes & dynamometers. Students will be able to understand the concepts of displacement, velocity and acceleration of simple mechanism, drawing the profile of cams and its analysis, gear kinematics with gear train calculations, theory of friction, clutches, brakes & dynamometers.

UNIT – I **[8 Hrs.]**

Basic concept of mechanism, link, kinematics pairs, kinematics chain, mechanism, Difference between machine and mechanism, Inversions, machine, simple & compound chain, Degrees of freedom, Estimation of degree of freedom of mechanism by Grubber's criterion and other methods. Harding's notations, Classification of four bar chain , Class-I & Class-II, Kutchbach theory, Various types of mechanism such as Geneva wheel, Pawl and ratchet mechanism, Exact straight line mechanism, Approx. straight line mechanism, Transport mechanism.

UNIT – II **[8 Hrs.]**

Quantitative kinematics analysis of mechanisms: - Displacement, Velocity and Acceleration analysis of planer mechanism by graphical method as well as analytical method. Coriolis component of acceleration, Instantaneous center method, Kennedy's theorem.

UNIT – III **[8 Hrs.]**

Concepts of cam mechanism, Comparison of cam mechanisms with linkages. Types of cams and followers and their applications. Synthesis of cam for different types of follower motion like constant velocity, parabolic, SHM, cycloid etc.

UNIT – IV **[8 Hrs.]**

Concept of motion transmission by toothed wheels, comparison with cams and linkages, various tooth profiles, their advantages and limitations, gear tooth terminologies, concept of conjugate action, law of conjugate action, kinematics of involute gear tooth pair during the contact duration,

highlighting locus of the point of contact, arc of contact, numbers of pairs of teeth in contact, path of approach and path of recess, interference, undercutting for involute profile teeth.

Kinematics of Spiral and helical gears, Kinematic analysis and torque analysis of simple epicyclic gear train.

UNIT – V **[8 Hrs.]**

Synthesis of Mechanism:- Introduction to type, Number and dimensional synthesis, Synthesis of Mechanism by graphical method, Transmission angle, Freudenstein's equation, Roberts Cognate Linkage.

UNIT – VI **[8 Hrs.]**

Laws of friction, Friction of inclined plane, Efficiency of inclined plane, Friction in journal bearing-friction circle, Pivots and collar friction-uniform pressure and uniform wear. Clutches, Brakes & Dynamometers: Single, multiple and cone clutch, Shoe brake, Band brake, Band and Block brake, Absorption and transmission type dynamometers (Numerical are expected on clutches and brakes only).

LIST OF TUTORIALS:

1) Drawing sheets on Inversion of
   i) Class I & Class II four bar chain
   ii) Single slider crank chain
   iii) Double slider crank chain
2) Problem on degree of freedom of mechanisms
3) Problems on kinematic analysis i) Graphical method ii) Analytical method
4) Cam constructions
5) Problem on gears
6) Analysis of epicyclic gear train with torque analysis
7) Problems on synthesis
   i) Graphical method
   ii) Analytical method
8) Study of construction and working with neat sketch of
   i) Clutches
   ii) Brakes
   iii) Dynamometers

TEXT BOOKS:

1. Theory of Machine, S. S. Rattan, Tata McGraw Hill.
2. Mechanism and Machine Theory, J.S. Rao & Dukki Patti, New Age International (P) Ltd, Publishers.
3. Theory of Machines, P L Ballaney, Khanna Publications.

Priyadarshini College of Engineering, Nagpur
Department of Mechanical Engineering

This is to certify that this is a bonafide record of project work entitled **FABRICATION OF PLASTIC TAR MANUFACTURING AND AUTOMATIC SPREADING MECHANISM** carried out by:

Mr. Rishav Kumar Singh (104)	Mr.Mohan Dewangan (151)
Mr.Vaibhav Warjurkar (101)	Mr.Kartik Deshmukh (119)
Mr.Shubham Jawade (111)	Mr. Gulshan Sontakke (130)
Mr.Piyush Misar (131)	Mr.Ajinkya Banarse (155)

of the B.E., Department of Mechanical Engineering, during the academic year 2017-2018, 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.M.S.Giripunje
(Guide)

Dr. C. N. Sakhale
(Project Incharge)

Dr. K.S. Zakiuddin
(Head of Department)

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

Dr. M. P. Singh Professor
(Principal)

ABSTRACT

As per the technical evolution and latest trends taken into consideration here effectively created a system i.e. Tar Distribution system for Plastic tar road manufacturing. This project uses 4 wheel operated switch board control system, heating arrangement for molten tar and rope pulley mechanism to put tar in multiple layers. This project uses a tar carrying arrangement along with some outlets to distribute molten tar in multiple layers. The solid tar entered into vessel and heated by strong heater, which is generalized heating arrangement so that system can able to move anywhere. This system uses 4 wheel operated switch board control mechanism so with the help of multi-layer switch board this system can able to move anywhere according to requirement. This system uses rope pulley arrangement, heating arrangement, 4 wheel drive system.

Disposal of waste materials including waste plastic bags has become a serious problem and waste plastics are burnt for apparent disposal which cause environmental pollution. Utilization of waste plastic in bituminous mixes has proved that the properties of mix are improved and disposal problems are also solved to some extent. The cleaned Plastic waste is cut into a size such that it passes through 2.36 mm sieve using shredding machine. The aggregate mix is heated and the plastic is effectively coated over the aggregates. This plastic waste coated aggregates are mixed with hot bitumen to prepare job mix formula. The use of the innovative technology will not only strengthen the road construction but also increase the road life as well as will help to reduce the environment pollution. The present study investigates the use of waste plastic as a modifier for semi dense bituminous concrete. In this study the shredded plastic waste is mixed in hot aggregate and the plastic modified mix is prepared using 6%, 8%, 10%, 12%, and 14%plastic by weight of bitumen.

BEME702T4: ELECTIVE – I: POWER PLANT ENGINEERING (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 aims to cover the detailed coverage of steam, hydro, nuclear, diesel and gas turbine power plant. It also introduces emerging technology in power generation like wood/biomass power plant, waste fire power plant. Considering current global environmental scenario, emphasis is stressed over solar hydrogen systems and fuel cell. It also aims to make the students aware about fluidised bed combustion which is one of the best clean coal technology which provides option for biomass conversion. It includes analytical and theoretical treatment of concepts with the right blend of theory design and practice of power stations along with detailing of combined cycle mode of power generation, in depth coverage of thermal, hydroelectric, nuclear, gas turbine and diesel power plant, in depth knowledge of emerging technologies (alternative power plants).

UNIT – I **[8 Hrs.]**

ECONOMICS AND POWER GENERATION:
Energy Introduction: - power and energy, sources of energy, Indian energy scenario.
Fluctuating loads: - Load curves, various terms and definitions, effect of fluctuating loads, Power and energy, sources of energy, numerical.
Economic analysis; - Tarrif load divison, cost of electricity, power plant economics, economic scheduling principle, numerical.

UNIT – II **[8 Hrs.]**

STEAM POWER PLANT:-.
Analysis of steam cycles: Ideal working fluid for vapour power cycles, Rankine cycle with regeneration and reheating, optimum degree of regeneration, feed water heaters.
Combine cycle power generation:-Binary vapour power cycles, combined cycle plants, gas turbine, steam turbine power plant, cogeneration.

UNIT – III **[8 Hrs.]**

COAL COMBUSTION AND STEAM GENERATORS:-
Coal –its properties, coal analysis, combustion reactions , actual air fuel ratio, draught, fans.
Combustion equipment for burning coal: - stoker, crushers, pulveriser, cyclone furnace, fuel firing methods, fluidized bed combustion.
Steam generators:- High pressure boilers, economiser, super heater, reheater, air preheater, electrostatic precipitator, fabric filter and bag houses, ash handling system, feed water treatment, steam turbine, condenser, cooling tower, steam power plant layout, pollution from steam power plant.

UNIT – IV **[8 Hrs.]**

HYDROELECTRIC POWER PLANT:-
Hydrology: - Rainfall runoff, hydrograph, flow duration curve, mass curve.

Hydroelectric power plant: - Site selection classification of hydroelectric power plant, details of different component, prime movers, governing, advantages and comparison with other power plants.

UNIT – V **[8 Hrs.]**

NUCLEAR POWER PLANT:-
Introduction to nuclear power plant: - Binding energy, energy release, nuclear reaction and its initiation, fission, component of nuclear reactors and its material, numerical based on energy release.
Nuclear reactor: - Types of reactor, PWR, BWR CANDU, gas cooled liquid metal fast breeder reactor, heavy water reactor and fusion power reactor.
Nuclear waste disposal: - Effect of nuclear waste on environment, its disposal to soil, water, air, sea etc., comparison with other power plants.

UNIT – VI **[8 Hrs.]**

Gas turbine power plant: Introduction, classification, various components, different arrangement, governing, methods to improve efficiency, comparison with other power plants.
Diesel power plant: - Introduction, outline type of engines, different components, performance, plant layout, comparison with other power plant.
Emerging technologies (alternative plants): Solar thermal conversion, photovoltaic power generation, solar hydrogen energy, fuel cell, wind energy, ocean energy, tidal energy, geothermal energy, MHD power generation. Wood/biomass power plant.

LIST OF TUTORIALS: Tutorials based on above syllabus.

TEXT BOOKS:

1. Power Plant Engineering, P. K. Nag, Tata McGraw Hill publication.
2. Power Plant Engineering, Domkundwar, Dhanpat Rai & Sons.

REFERENCE BOOKS:

1. Power Plant Technology, M. M. El-Wakil, McGraw Hill publication.
2. Power Plant Engineering, S.Gautam, Vikas Publication Pvt. Ltd.

Priyadarshini College of Engineering, Nagpur
Department of Mechanical Engineering

This is to certify that this is a bonafide record of project work entitled **Potential of Biomass for Electrical Power Generation at Thermal Power Plant** carried out by Abhinav Anand, Akash Tidke, Anup Prasad, Bhavesh Vasudeo Hore, Md. Shahid Nadeem, Parimal Prakash, Shoaib Babbu Sheikh, Tuhin Kumar Mondal, Vikram Dhakate, Vivek Kumar Yadav of the Bachelor of Engineering, Department of Mechanical Engineering, during the academic year 2017-2018, 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.

A.S. Nilewar
Guide

Dr. C. N. Sakhale
Associate Professor & Project Incharge
Department of Mechanical Engineering
Priyadarshini College of Engineering Nagpur

Dr. K. S. Zakiuddin
Professor & Head of Department
Department of Mechanical Engineering
Priyadarshini College of Engineering
Nagpur

Dr. M. P. Singh
Principal
Priyadarshini College of Engineering Nagpur

ABSTRACT

In view of energy and environmental problems associated with the use of fossil fuels (coal, petroleum and gas) in power generation, an increasing attention is being paid world over by the scientists and technocrats for the utilization of renewable energy sources in power generation, metallurgical industries etc. There are various type of renewable energy sources such as solar, wind, hydropower, biomass energy etc. out of these renewable energy sources. biomass is more economically viable for almost all the continents in the world. Biomass is a carbonaceous material and provides both the thermal energy and reduction for oxides, where as other renewable energy sources can meet our thermal need only. Amongst all the solid fuel like coal etc. biomass is the purest fuel consisting of very lesser amount of ash materials.

Presently, co-firing (coal + biomass) has been proved to be more attractive and economically viable technique for power generation. In the present work, briquettes were prepared by mixing non-coking coal and the related biomass species in different ratio (coal: biomass = 95:05, 90:10, 85:15, 80:20). The objectives have been to examine their energy values and power generation potential. 3rd chapter of this theses deal with the experimental work carried out in completion of this project work. The experimental works included determination of proximate analysis, energy value & ash fusion temperature (AFT) of different components of biomass, coal & there mixture.

Keywords: proximate analysis, ash fusion temperature, electricity generation, energy content, non-woody biomass species.

BEME704T: ENERGY CONVERSION - II (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 study the energy conversion systems and power generation systems. It includes the construction, operation and analysis of air compressors, internal combustion engines. Introduction to conventional refrigeration and air conditioning is also included. At the end of this course, students will be able to analyze the performance of air compressors, internal combustion engines and refrigeration and air conditioning installations.

UNIT – I **[8 Hrs.]**

Air Compressors:- Introduction, classification, applications.

Positive displacement Compressors:-
Reciprocating compressors: - Construction and working, isothermal, polytropic & adiabatic compression process, work done with and without clearance, P-V diagram, volumetric efficiency, effect of clearance, isothermal efficiency, methods for improving isothermal efficiency, volumetric efficiency, mechanical efficiency, multistage compression, intercooling, condition for minimum work input.

UNIT – II **[8 Hrs.]**

Rotary compressors:-
Positive displacement rotary compressors- Roots blower & vane blower: - Principle, operation, parts, indicator diagram, work done, roots efficiency, vanes efficiency. (No analytical treatment expected)

Centrifugal compressor:- Principle, operation, parts, velocity diagrams, static & total head quantities, work done by impeller, isentropic efficiency, width of impeller and diffuser blades, slip factor, pressure coefficient, power input factor.

Axial flow compressor:- Principle, operation, parts, velocity diagrams, work done, degree of reaction, stage efficiency compressor characteristics, surging, chocking, stalling, polytropic efficiency.

UNIT – III **[8 Hrs.]**

Internal Combustion Engines: Introduction, classification, components of I.C.Engines, working of two stroke and four stroke S.I. and C.I. Engines, valve and port timing diagram. Advantages and disadvantages, applications.

Combustion in I. C. Engines: Combustion in S. I. Engine, stages of combustion, ignition lag, detonation. Combustion in C. I. Engine, stages of combustion, delay period, diesel knock, abnormal combustion in S.I. and C.I. engines, detonation and knocking.

Fuel injection in I. C. Engines:
Fuel supply to S. I. Engine, carburetion, simple carburetor, components, operation, MPFI.

Fuel supply to C. I. Engine, air injection system, solid injection, fuel pump & fuel injector. (Analytical treatment not expected)

UNIT – IV **[8 Hrs.]**

Testing of I. C. Engines:- Performance parameters, measurement of indicated, friction & brake power, measurement of speed, fuel & air consumption, calculation of indicated & brake thermal efficiency, volumetric efficiency, relative efficiency and mechanical efficiency, percentage of excess air, Heat balance sheet, exhaust gas calorimeter, exhaust analysis, performance characteristics, factors influencing the performance of I.C. engines, performance analysis of single and multi cylinder I. C. engines.

UNIT – V **[8 Hrs.]**

Refrigeration: Introduction, definition & unit of refrigeration, single stage vapour compression refrigeration system, effect of subcooling and superheating on COP with P-h and T-S diagram, Vapor absorption refrigeration system (concept only), refrigerants, refrigerants nomenclature, air refrigeration systems.

UNIT – VI **[8 Hrs.]**

Air conditioning: Introduction, psychrometric properties and processes, human comfort and factors affecting comfort, Bypass factor, application of Psychrometrics to simple air conditioning systems, typical summer and winter air conditioning system(concept only), evaporative cooling, working of air washer.

LIST OF TUTORIALS:

1) Analysis of single stage reciprocating compressors.
2) Analysis of multistage reciprocating compressors
3) Analysis of double acting reciprocating compressors
4) Performance analysis of centrifugal compressor.
5) Performance analysis of axial flow compressor.
6) Numerical on Morse test.
7) Analysis of multicylinder engines.
8) Numerical on heat balance sheet.
9) Analysis of simple vapour compression refrigeration system.
10) Analysis of VCRS with superheating & sub cooling system.
11) Analysis of Air Conditioning systems.

TEXT BOOKS:

1. Thermal Engineering, P.L.Ballaney, Khanna publishers.
2. Thermal Engineering, R. K. Rajput, Laxmi publications.
3. IC Engine, V. Ganesan, McGraw Hill education.
4. Refrigeration and & Air conditioning, Domkundwar, Arora, Dhanpat Rai & Sons.
5. Thermal Engineering, M.M. Rathore, TMH
6. Refrigeration & Air conditioning, C. P. Arora, PHI Learning.

REFERENCE BOOKS:

1. Internal Combustion Engines, E. Obert, Intex educational publication.

PRIYADARSHINI COLLEGE OF ENGINEERING, NAGPUR

DEPARTMENT OF MECHANICAL ENGINEERING

CERTIFICATE

This is to certify that the project entitled **"VAPOUR COMPRESSION REFRIGERATION SYSTEM OPERATED BY SOLAR POWER"** has been completed by **ABINANDAN JHA, AJAZ SAYYED, SHAHID KAISHAR, GULAB AHMAD, SUMIT SONKAR, YUVRAJ SINGH** student of B.E (Mechanical Engineering) of this institute in satisfactory manner and in partial fulfilment of the requirement for the degree of Bachelor of Engineering in Mechanical Engineering of the Rashtrasant Tukadoji Maharaj Nagpur University

Prof. P.V. Jadhav
Guide
Department of Mechanical Engineering
P.C.E, Nagpur

Dr. K.S. Zakiuddin
Professor & Head
Department of Mechanical Engineering
P.C.E, Nagpur

Dr.M.P. Singh
Principal
Priyadarshini College of Engineering & Architecture
Hingna Road, Nagpur

Abstract

Interest in utilizing solar-driven refrigeration systems for air-conditioning or refrigeration purposes has grown continuously. Solar cooling is comprised of many attractive features and is one path towards a more sustainable energy system.

Compared to solar heating, the cooling load, particularly for air-conditioning applications, is generally in phase with solar radiation. The refrigerator is able to operate directly by solar PV panels, with battery and is therefore suitable for locations where little maintenance and reliable operation is mandatory.

Vapor compression technology is well established and recently used in electronics cooling. Vapour Compression Refrigerator (VCR), consists of four major components evaporator, condenser, compressor and expansion device which are connected in a cycle. VCR is commonly used in a wide range of commercial and industrial refrigeration applications and represents a substantial fraction of the installed refrigeration systems. It depends on evaporating temperature, condensing temperature, sub-cooling, compressor pressure and environmental temperature.

Refrigerators are cyclic devices that work with fluid refrigerants, having the objective to maintain the refrigerated space at a low temperature by removing heat from it. The reversed Carnot cycle can serve as a standard against which actual refrigeration cycles are compared. In the article is analyzed a vapour-compression refrigeration system using R134a refrigerant. With experimental values of the evaporating and condensing temperatures and using the Cool Pack program, the system performance may be evaluated. In nature the heat-transfer process occurs in the direction of decreasing temperature that is from high temperature regions to low temperature ones without requiring any devices.

BEME403T: HYDRAULIC MACHINES (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 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

CERTIFICATE

Priyadarshini College of Engineering, Nagpur
Department of Mechanical Engineering

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

WATER UPLIFTING AND POWER GENERATION USING MERRY-GO-ROUND

carried out by

1) ABHISHEK SINGH	**5) NAYAN PAKHALE**
2) SUBODH MANDAL	**6) SONU KUMAR**
3) SHUBHAM GOKHE	**7) RITESH KUMAR**
4) MD HASHMATULLA ANSARI	**8) AMIT KUMAR**

of the B.E., Department of Mechanical Engineering, during the academic year 2017-2018, in the partial fulfillment of the requirement for the award of the degree of Bachelor of Engineering (Mechanical Engineering) offered by the Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur.

DR. V.M. Sonde
Guide

Dr. C. N. Sakhale
Project Incharge

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

Dr. M. P. Singh
Principal

ABSTRACT

The need of electricity is increasing day to day but the resources are very limited. This project intends to create more efficient and cost-effective way for playground equipment to be implemented for power generation & uplifting of water. The redesigned and reconstructed Merry-Go-Round human powered generator converts mechanical energy into electrical energy as well as the mechanism introduced in it helps in uplifting of water.

This thesis analyses a water pump & power generator powered by a children's roundabout (Merry Go Round), which may be used in the developing world. It may be implemented in certain areas where there is a problem in access to electricity. This Merry Go Round is analyzed as an example of 'design for development', an area of current design attention to the developing world where the power generation and water pumping can be done simultaneously at small scale.

BEME802T3: INDUSTRIAL FLUID POWER (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 : Oil Hydraulic systems & pneumatic systems are widely used in all fields of engineering as clean source of motive power. Low cost automation systems with the use of pneumatics have become popular as manufacturing aids. Mechanical engineers come across such systems in all segments of industries.

This course is designed to understand the basic concepts of various components of hydraulic & pneumatic systems, the working principles of various components used for hydraulic & pneumatic systems, selection of appropriate components required for simple hydraulic and pneumatic circuits, listing probable causes of faults or defects in the components of hydraulic & pneumatic circuits. At the end of this course, students will be able to understand, discuss & apply the hydraulic & pneumatic systems in industries/applications.

UNIT – I **[8 Hrs.]**

Fluid power systems: Components, advantages, applications in the field of Machine tools, material handling, hydraulic presses, mobile and stationary machines, clamping and indexing devices, Transmission of power at static and dynamic states. Types of Hydraulic fluid petroleum based, synthetic and water based. Properties of fluids, selection of fluids, additives, effect of temperature & pressure on hydraulic fluids. Seals sealing materials, selection of seals, filters, strainers, sources of contamination of fluid & its control. Hydraulic and pneumatic symbols.

UNIT – II **[8 Hrs.]**

Pumps – Types of Pumps, vane pump, gear pump, gerotor pump, screw pump, radial and axial piston pumps. Power and efficiency calculations, selection of pumps for hydraulic power transmission.

Accumulators & Intensifiers: Types and functions of accumulators, intensifiers, applications, selection and design procedure.

UNIT – III **[8 Hrs.]**

Valves – Necessity of pressure control valves, direction control valves and flow control valves. Construction, working and symbols of pressure control valves – pressure relief valve, pressure reducing valve, pressure unloading valves and method of actuation of valves.
Direction control valves – Check valves, types of DC valves, poppet valve, spool valve, 2 way 2 position DC valve, 3 way 2 position DC Valve, 4 way 2 position D.C, 4 way 3 position D.C valves, rotary spool valves, open center, close center, and tandem center valves. Sequence valves, method of actuation of valves, manually operated, pilot operated and solenoid operated valves.

Flow control valves – Principle of operation, pressure compensated, non pressure compensated flow control valve, temperature compensated flow control valves. Meter in & meter out flow control circuits, bleed off circuits.

UNIT – IV **[8 Hrs.]**

Actuators- Construction, working and symbols of rotary actuators. Hydraulic motors.
Linear Actuators – Cylinders - Single acting, double acting, method of control of acceleration and deceleration. Calculation of piston velocity, thrust under static & dynamic applications.
Accessories – Pipes, hoses, fittings, oil filters, seals and gaskets.

UNIT – V **[8 Hrs.]**

Design of hydraulic circuits: Meter in, meter out circuits, bleed off circuit, sequencing circuit – travel dependant, pressure dependant hydraulic circuits for Milling machine & Shaper machine, motion synchronization circuit. Hydraulic circuits using sequence valves, counter balancing valves, unloading valves with the use of electrical controls. Trouble shooting and maintenance of hydraulic circuits.

UNIT – VI **[8 Hrs.]**

Introduction to pneumatic systems. Applications of pneumatic system, general layout of pneumatic system, merits and limitations of pneumatic systems.

Control Valves – Pressure regulating valves, flow Control valves, direction control valves.
Actuators – Rotary - Air motors, types, construction, working principle. Linear- Cylinders- Types, construction & working principle. Accessories – Pipes, Hoses, Fittings, FRL unit.

LIST OF TUTORIALS:

1) Study of hydraulic systems.
2) Demonstration of pneumatic systems.
3) Study of directional control valves.
4) Study of actuators.
5) Study of troubleshooting & maintenance of hydraulic circuit.
6) Study of troubleshooting & maintenance of pneumatic circuit.
7) Demonstration on meter in and meter out circuit.
8) Study of hydraulic circuit of Shaper machine.

TEXT BOOKS:

1. Oil Hydraulic system- Principle and maintenance, S.R Majumdar, Tata Mcgraw Hill Company.
2. Pneumatics Systems Principles and Maintenance, S.R Majumdar, Tata Mcgraw Hill Company.

REFERENCE BOOKS:

1. Introduction to Hydraulic & Pneumatics, S. Lango & V. Soundarajan, Prentice Hall of India.
2. Hydraulics and Pneumatics, H.L. Stewart, Industrial Press.
3. Fluid Power Design Handbook, Frank Yeaple, CRC Press.

CERTIFICATE

Priyadarshini College of Engineering, Nagpur
Department of Mechanical Engineering

This is to certify that this is a bonafide record of project work entitled **Human powered water pump** carried out by Mr. Tejas Bangale, Mr. Kaushik Kalambe, Mr. Sandesh Lokhande, Mr. Manish Kumar Sahu, Mr. Rajnish Kawale, Mr. Moshin Bansod, Mr. Raj Bawane, Mr. Shubham Mahajan Students of the B.E., Department of Mechanical Engineering, during the academic year 2017-2018, 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.

Dr. P. S. Chaudhari
Guide

Dr. C. N. Sakhale
Project Incharge

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

Dr. M. P. Singh
Principal

ABSTRACT

The objective of this project was to design, fabricate and experimentally investigate the working of Human Powered Water Pump which used in small drinking water supply and garden irrigation. It consists of a Reciprocating pump operated by pedal power. The development of a Human Powered Water Pump machine was undertaken with the intention of providing a simple cost solution to the problem of delivery of ground water with relatively less effort. This project analyzes the development of a Human Powered Water Pump for rural use. It is not only free from pollution but also provide healthy exercise. This development was prompted due to the need for pumping systems that does not use electricity as its power source in under developed area. The system is composed of a reciprocating pump powered by pedaling. The pedal power is being transmitted to the pump via a chain drive. Pumps are a common means of lifting water from a clean ground water source to a useful point of access, but all pumps have moving parts and are therefore destined to break proper selection of a pump will reduce undesirable downtime and will empower the local community to manage their water source. Based on this design, the pump has a cylinder bore of 80.9 mm and a stroke of 90 mm. The results of the test carried out showed that the pump discharge was 15.3 lit/min at a head of 9.5 feet which is fairly a good enough result for a pedal operated pumping system. It can be used for irrigation and drinking water purposes. It is more productive operated pumping system and is time saving. The only input required for the efficient working of pump is 'Human Power'.