AMITY UNIVERSITY

RAJASTHAN

Amity School of Engineering and Technology

Minutes of Board of Studies

2021-2022

AMITY UNIVERSITY
RAJASTHAN

No. : AUR/REG/5790 Dated : 28/10/2021

Board of Studies [BOS]
Amity School of Engineering & Technology (ASET)
Electronics & Communication Engineering and Electrical Engineering

For structuring, revision and updating of Academic Progrmmes, viz. framing of Curriculum, Syllabi and Scheme of Evaluation etc. the Board of Studies of Amity School of Engineering & Technology (ASET) - Electronics & Communication Engineering and Electrical Engineering is re-constituted as under :

1.	**Prof. Pankaj Kumar Pandey**	**Coordinator - ASET**	:	**Convener**
Internal Subject Experts				
2.	Dr. Sanjay Kumar Singh	Associate Professor - ASET	:	Member
3.	Dr. Pramod Kumar Bhatt	Associate Professor - ASET	:	Member
External Subject Experts				
4.	Dr. Pushpendra Singh	Associate Professor Department of EEE, JKLU, Jaipur	:	Member
Industry / R&D Organization Experts				
5.	Er. Mr. Arvind Kaul	CEO & Director Enertrak Instruments Pvt. Ltd., Jaipur	:	Member

AMITY UNIVERSITY RAJASTHAN JAIPUR

Dr. Nitin Bhardwaj
Registrar

AMITY UNIVERSITY
RAJASTHAN

No. : AUR/REG/5794 Dated : 28/10/2021

Board of Studies [BOS]
Amity School of Engineering & Technology (ASET)
Computer Science Engineering and Information Technology

For structuring, revision and updating of Academic Progrmmes, viz. framing of Curriculum, Syllabi and Scheme of Evaluation etc. the Board of Studies of Amity School of Engineering & Technology (ASET) - Computer Science Engineering and Information Technology is re-constituted as under :

1.	**Prof. Pankaj Kumar Pandey**	**Coordinator - ASET**	: **Convener**
Internal Subject Experts			
2.	Dr. Sunil Pathak	Associate Professor - ASET	: Member
3.	Dr. Kapil Kumar Nagwanshi	Associate Professor - ASET	: Member
External Subject Experts			
4.	Dr. Pilli Emmanuel Shubhakar	Associate Professor & Head Deptt. of Computer Science & Engineering MNIT, Jaipur	: Member
Industry / R&D Organization Experts			
5.	Mr. Tushar Srivastava	Software Developer HCL Technologies, Noida	: Member

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Dr. Nitin Bhardwaj
Registrar

AMITY UNIVERSITY
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No. : AUR/REG/5793 Dated : 28/10/2021

Board of Studies [BOS]
Amity School of Engineering & Technology (ASET)
Chemical Engineering

For structuring, revision and updating of Academic Progrmmes, viz. framing of Curriculum, Syllabi and Scheme of Evaluation etc. the Board of Studies of Amity School of Engineering & Technology (ASET) – Chemical Engineering is re-constituted as under :

1.	**Prof. Pankaj Kumar Pandey**	**Coordinator - ASET**	:	**Convener**
Internal Subject Experts				
2.	Mr. Sachin Bansal	Assistant Professor - ASET	:	Member
3.	Dr. Rajeev Sharma	Assistant Professor - ASET	:	Member
External Subject Experts				
4.	Dr. Sushant Upadhyay	Associate Professor Department of Chemical Engineering MNIT, Jaipur	:	Member
Industry / R&D Organization Experts				
5.	Er. Parag Kansal	Project Manager Avinex Soft Pvt. Ltd., Jaipur	:	Member

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Dr. Nitin Bhardwaj
Registrar

AMITY UNIVERSITY
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No. : AUR/REG/5792 Dated : 28/10/2021

Board of Studies [BOS]
Amity School of Engineering & Technology (ASET)
Civil Engineering

For structuring, revision and updating of Academic Progrmmes, viz. framing of Curriculum, Syllabi and Scheme of Evaluation etc. the Board of Studies of Amity School of Engineering & Technology (ASET) – Civil Engineering is re-constituted as under :

1.	**Prof. Pankaj Kumar Pandey**	**Coordinator - ASET**	:	**Convener**
Internal Subject Experts				
2.	Mr. Pankaj Sharma	Assistant Professor - ASET	:	Member
3.	Mr. Ronak Parikh	Assistant Professor - ASET	:	Member
External Subject Experts				
4.	Prof. Pankaj Dhemla	Head of the Department Department of Civil Engineering Poornima Group of Institutions Jaipur	:	Member
Industry / R&D Organization Experts				
5.	Mr. N. K. Kumawat	Senior Executive Engineer (Civil) BSNL, Jaipur	:	Member

NB

Dr. Nitin Bhardwaj
Registrar

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No. : AUR/REG/5791

Dated : 28/10/2021

Board of Studies [BOS]
Amity School of Engineering & Technology (ASET)
Mechanical Engineering

For structuring, revision and updating of Academic Progrmmes, viz. framing of Curriculum, Syllabi and Scheme of Evaluation etc. the Board of Studies of Amity School of Engineering & Technology (ASET) – Mechanical Engineering is re-constituted as under :

1.	**Prof. Pankaj Kumar Pandey**	**Coordinator - ASET**	:	**Convener**
Internal Subject Experts				
2.	Mr. Mangal Singh Sisodiya	Assistant Professor - ASET	:	Member
3.	Dr. Nitesh Singh Rajput	Assistant Professor - ASET	:	Member
External Subject Experts				
4.	Prof. D. N. Naresh	Director Engineering & Technology MJRP University, Jaipur	:	Member
Industry / R&D Organization Experts				
5.	Mr. Ashish Lohar	Manager Operation UltraTech Cement, Kotputli, Jaipur	:	Member

Dr. Nitin Bhardwaj
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AMITY SCHOOL OF ENGINEERING & TECHNOLOGY

Department of Civil Engineering

Subject: BOS Meeting, 30th November 2021

The agenda items were taken up and after considerable deliberations amongst the BOS members, the following decisions were taken:

1. Changes in the contents of the courses (highlighted).
2. Change of credits Transportation Engineering – II (BTV/BCE 504) from 3 to 4.

The meeting ends with thanks to all the members of the BOS.

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ATTENDANCE SHEET FOR BOS MEETING

Dated: 30th November 2021

S.No.	Name	Designation	Details	Signature
1	Prof. Pankaj Kumar Pandey	Professor -ASET	Chairperson	
2	Mr. Pankaj Sharma	Assistant Professor	Member	
3	Mr. Ronak Parikh	Assistant Professor	Member	
4	Prof. Pankaj Dhemla	HOD, Dept. of Civil Engineering, Poornima Group of Institutions, Jaipur	Member	
5	Mr. N. K. Kumawat	Senior Executive Engineer (Civil), BSNL, Jaipur	Member	

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AMITY SCHOOL OF ENGINEERING & TECHNOLOGY

Department of Chemical Engineering

Subject: BOS Meeting, 30th November 2021

The agenda items were taken up and after considerable deliberations amongst the BOS members, the following decisions were taken:

Changes in module of following subjects:

Course Code	Course Title
BTH 302	Fluid and Particle Mechanics
BTH 303	Chemical Process Calculations
BTH 402	Chemical Engineering Thermodynamics-I
BTH-502	Chemical Engineering Thermodynamics-II
BTH- 601	Process Dynamics & Control
BTH- 607	Energy Resources & Utilization

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The meeting ends with thanks to all the members of the BOS.

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ATTENDANCE SHEET FOR BOS MEETING

Dated: 30th November 2021

S.No.	Name	Designation	Details	Signature
1	Prof.(Dr.) Pankaj Kumar Pandey	Professor, ASET	Chairperson	
2	Dr. Rajeev Sharma	Assistant Professor	Member	
3	Mr Sachin Bansal	Assistant Professor	Member	
4	Dr. Sushant Upadhyay	Associate Professor, Dept. of Chemical Engineering, MNIT, Jaipur	Member	

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AMITY SCHOOL OF ENGINEERING & TECHNOLOGY

Department of Mechanical Engineering

Subject: BOS Meeting, 30th November 2021

The agenda items were taken up, and after considerable deliberations amongst the BOS members, the following decisions were taken:

1 **Following course has been introduced to be implemented from the 2022 session:**

i) Welding and Allied processes BME 312, (III Sem) as a domain elective course.

ii) Quality Assurance & Quality Control BME 415, (IV Sem) as a domain elective course.

iii) Industrial Engineering BME 416, (IV Sem) as a domain elective course.

iv) Additive Manufacturing BME 417, (IV Sem) as a domain elective course.

v) Mechanics of Metal cutting BME 502, (V Sem) as a core course

vi) Mechanics of Metal cutting Lab BME 522, (V Sem) as a practical course.

vii) Thermal Science & Engineering Progress BME 510, (V) as a domain elective course.

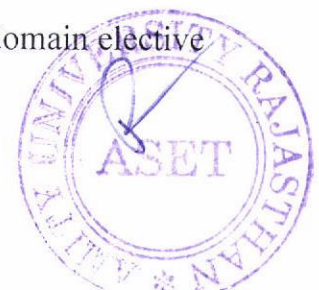
viii) Heat & Mass Transfer Lab BME 523, (V Sem) as a practical course.

ix) Fluid Power System BME 612 (VI Sem) as a core course.

x) Fluid Power System Lab BME 632 (VI Sem) as a practical Course.

xi) Industrial Safety BME 635, (VI Sem) as a domain elective course.

xii) Sustainable Engineering BME 636, (VI Sem) as a domain elective course.



xiii) Flexible Manufacturing System BME 637, (VI Sem) as a domain elective course.

xiv) Modeling and Simulation Lab BME 625, (VI Sem) as a practical course.

xv) Green Vehicle Technology BME 710, (VII Sem) as a core course.

xvi) Composite Materials BME 711, (VII Sem) as a domain elective course.

xvii) Finite Element Methods BME 712, (VII Sem) as a domain elective course.

xviii) Advanced Machining Methods BME 800, (VIII Sem) as a core course.

xix) Alternative Source of Energy BME 807, (VIII Sem) as a domain elective course.

xx) Reliability and Maintenance BME 808, (VIII Sem) as a domain elective course.

2 **Revision of the credits of the following core course.**

i) Fluid mechanics course, BME 402 (IV Sem)

ii) Heat & Mass Transfer, BME 503 (V Sem)

iii) Operational Research, BME 602 (VI Sem)

3. **Shifting of the following courses**

i. Internal combustion Engines, BME 514 (V Sem).

4. **Revision in the course content and nomenclature of the following course.**

i. Elements of Mechanical Engineering, BME 104 (I Sem)

ii. Engineering Mechanics, BME 204 (II Sem)

iii. Engineering Graphics, BME 205 (II Sem)

iv. Mechanics of Solids BME 303, (III Sem)

v. Mechanics of Solids lab BME 323, (III Sem)

vi. Thermodynamics, BME 302 (III Sem)

vii. Fluid Mechanics, BME 402 (IV Sem)

viii. Mechanics of Metal Cutting BME 502, (V Sem)

ix. Mechanics of Metal Cutting BME 522, (V Sem).

The meeting ends with thanks to all the members of the BOS.

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ATTENDANCE SHEET FOR BOS MEETING

Dated: 30th November 2021

S.No.	Name	Designation	Details	Signature
1.	Prof. (Dr.) Pankaj Kumar Pandey	Professor, ASET	Chairperson	
2.	Mr. Mangal Singh Sisodiya	Assistant Professor, Coordinator, Mechanical Engineering ASET	Member	
3.	Dr. Nitesh Singh Rajput	Assistant Professor, Mechanical Engineering, ASET	Member	
4.	Prof. D. N. Naresh	Head of Department, Mechanical Engineering, MJRP Jaipur RJ	Member	
5.	Mr. Ashish Lohar	Manager Operation Ultra Tech Cement, Kotputli, RJ	Member	

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AMITY SCHOOL OF ENGINEERING TECHNOLOGY (ASET)

WELDING AND ALLIED PROCESSES

Course Code: BME 312 **Credit Units: 03**

Course Objective:

- To understand the various welding process and different types of welding
- Application of various welding processes

Course Contents:

Module I: Introduction to the Processes of Welding

Introduction to joining technology, General survey, and classification of welding processes, Safety and hazards in welding.

Module II: Fusion Welding Processes

Physics of the welding arc and arc characteristics, Metal transfer & its importance in arc welding, Various forces acting on a molten droplet and melting rates, Power sources for arc welding, Welding consumables: fluxes, gasses and filter materials, SMAW, SAW, GTAW and related processes, GMAW and variants, PAW, Gas We4lding, Soldering, Brazing and diffusion bonding, Thermal cutting of metals, Surfacing and spraying of metals, Resistance welding processes: spot seam, butt, flash, projection, percussion etc.

Module III: Thermally Induced Distortion Welding

Thermit welding, Electro-slag and electrogas welding, Solid State and radiant energy welding processes such as EBW; LBW; USW

Module IV: Molten Metal Transfer in Consumable Electrode

Explosive welding; Friction welding and Underground Welding. Welding of plastics, Advances, challenges and bottlenecks in welding. Welding of Plain carbon, low alloy, austenitic and other nickel chrome steels. Problems and procedures for welding non ferrous alloys, electrode selection, design of welded joints, distortion, residual stresses and stress relieving, Weld defects and Non Destructive testing.

Examination Scheme:

Components	Internal assessment	Attendance	MTE	ESE
Weightage (%)	30	5	15	50

MTE: Mid Term Exam, ESE: End Semester Examination;

Text & References:

Text:

- Foundry Technology by O.P. Khanna
- Principles of Metal casting by P.L. Jain

References:

- Little, Welding and Welding Technology, Tata Mc Graw Hill
- R.S.Parmar, Welding and Welding Processes, Khanna Publication
- Welding Technology by O.P. Kahanna

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QUALITY ASSURANCE & QUALITY CONTROL

Course Code: BME 415 **L:03 C:03**

Unit-I: Quality Concepts: Evolution of Quality control, concept change, TQM Modern concept, Quality concept in design, Review off design, Evolution of proto type. **Control on Purchased Product:** Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. **Manufacturing Quality:**Methods and Techniques for manufacture, Inspection and control of product, Quality in sales and services, Guarantee, analysis of claims.

Unit-II: Quality Management: Organization structure and design, Quality function, decentralization, Designing and fitting organization for different types products and company, Economics of quality value and contribution, Quality cost, optimizing quality cost, seduction programme. **Human Factor in Quality:**Attitude of top management, co-operation of groups, operators attitude, responsibility, causes of operators error and corrective methods.

Unit-III:Control Charts Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts. **Attributes of Control Charts**Defects, construction and analysis off-chart, improvement by control chart, variable sample size, construction and analysis of C-chart.

Unit-IV:Defects Diagnosis and Prevention Defect study, identification and analysis of defects, corrective measure, factors affecting reliability, MTTF, calculation of reliability, Building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

Unit-V:IS0-9000 and its concept of Quality Management:

ISO 9000 series, Taguchi method, JIT in some details

EXAMINATION SCHEME:

Components	Other Components	Attendance	MTE	ESE
Weightage (%)	30	5	15	50

References:

1. Lt. Gen. H.LaI, "Total Quality management", Wiley Eastern Limited, 1990.
2. Greg Bounds. "Beyond Total Quality Management". McGraw Hill, 1994.
3. Menon, H.G, "TQM in New Product manufacturing McGraw Hill 1992",

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INDUSTRIAL ENGINEERING

Course Code: BME 416 **L:3, C:03**

Course Objective:

The objectives of course is to create effective problem solving skills, Design, develop, implement, and improve integrated systems for healthy organization.

Course Contents:

Module I: Production, Planning and Control: Definition and importance, types of production -job, batch and mass forecasting, routing, scheduling, dispatching and follow up. Break even analysis and Gantt chart Project scheduling, application of CPM and PERT techniques Analysis and control of project cost in CPM and PERT, simple numerical problems

Module II: Inventory Control : Definition, types of inventory - Codification and standardization ABC analysis. Economic ordering quantity Procurement cost, carrying charges, lead-time, re-order point, simple problems.

Module III: Job Evaluation and Wage Plans & Industrial Legislation: Objective, Methods of job evaluation, job evaluation procedure, merit rating (Performance appraisal), method of merit rating, wage and wage incentive plans.

Module IV: Work Study : Definition, advantages and procedure of work-study. Difference between production and productivity, Factors to improve productivity Method Study :- Definition, objectives and procedure of method study. Symbols, flow process chart (man-machine-material), flow diagram, machine chart, two hand chart Critical examination. Developing a new method Principles of motion economy.

Module V: Plant Location and Layout : Definition, factors affecting the site selection of plant Factor affecting plant layout, types of layout. Material Handling : Principles of economic material handling Hoisting equipment - forklift truck, Cranes, Conveying equipment, elevators.

Evaluation:

Components	Assignment	Viva	MTE	Attendance	ESE
Weightage (%)	15	15	15	5	50

Text & References:

- Baldev Raj (2009) Practical Non-Destructive Testing- Narosa Publishing House Pvt. Ltd;
- J Prasad , and C. G. Krishnadas Nair (2017) Non-Destructive Test and Evaluation of Materials- McGraw Hill Education.
- Ravi Prakash,(2010) Non-Destructive Testing Techniques- New Age International Publishers.
- Lari and Kumar,(2013) Basics Of Non-Destructive Testing, S.K. Kataria & Sons.

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ADDITIVE MANUFACTURING

CourseCode: BME 417 **L:03 C:03**

Module I:
Introduction to Additive Manufacturing and classification. Applications of additive manufacturing in rapid prototyping, rapid manufacturing, rapid tooling, repairing and coating.

Module II:
Introduction to 3D-printing, Stereolithography apparatus (SLA), Fused deposition modelling (FDM), Laminated Object Manufacturing (LOM))

Module III:
Selective deposition lamination (SDL), Ultrasonic consolidation, Selective laser sintering (SLS), Laser engineered net shaping (LENS), Electron beam free form fabrication (EBFFF), Electron beam melting (EBM), Plasma transferred arc additive manufacturing (PTAAM), Tungsten inert gas additive manufacturing (TIGAM), Metal inert gas additive manufacturing (MIGAM).

Module IV:
Pre-Processing in Additive Manufacturing: Preparation of 3D-CAD model, Reverse engineering and Reconstruction of 3D-CAD model, Part orientation and support generation, STL Conversion, STL error diagnostics, Slicing and Generation of codes for tool path, Surface preparation of materials.

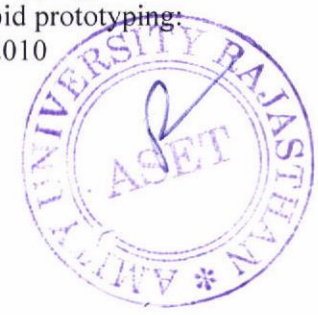
Module V :
Post-Processing in Additive Manufacturing: Support material removal, improvement of surface texture, accuracy and aesthetic; property enhancements.

EXAMINATION SCHEME:

Components	Other Components	Attendance	MTE	ESE
Weightage (%)	30	5	15	50

Text books: 1. Gibson, I, Rosen, D W., and Stucker, B., Additive Manufacturing Methodologies: Rapid Prototyping to Direct Digital Manufacturing, Springer, 2015

Reference books: 1. Chee Kai Chua, Kah Fai Leong, 3D Printing and Additive Manufacturing: Principles and Applications: Fourth Edition of Rapid Prototyping, World Scientific Publishers, 2014 2. Chua C.K., Leong K.F., and Lim C.S., "Rapid prototyping: Principles and applications", Third Edition, World Scientific Publishers, 2010



Mechanics of Metal cutting

Course Code: **BME 502** **L:03 C:03**

Course Objective:

Metal cutting involves removing metal through machining operations. Machining traditionally takes place on lathes, drill presses, and milling machines with the use of various cutting tools. Successful machining also requires knowledge about the material being cut. This course is designed in such way that it explains all aspects (process and tools) of metal cutting. The course also covers the common tooling setups and operations as well as specialized applications for the more experienced users.

Course Contents:

Module I: Introduction

Basic shape of cutting tools, Function of different angles of cutting tools, tool geometry and Nomenclatures- ASA, ORS systems, Conversion of angles, Tool Materials.

Module II: Mechanism of chip formation

Fracture & yielding mechanism, Types of chips, Factors involved in chip formation analysis, shear plane in flat chips, chip formation in drilling and milling.

Module III: Mechanism of metal cutting

Force system during turning, merchant circle diagram, velocity relationship, stress in conventional shear plane, Energy of cutting process, Ernst& merchant angle relationship, Lee-Shafer relationship, measurement of forces, Heat generation and temperature distribution in metal cutting.

Module IV: Theory of Tool wears

Criteria of wear, machinability and tool life, Flank wear, Crater wear, Taylor's tool life equation, causes and
mechanism of tool failure, cutting fluid, Economics of metal
machining.

Module V: Design for sheet metal works

Press working Terminology, press operation, types of dies, clearance, cutting forces, methods of reducing cutting forces, minimum diameter of piercing, center of pressure, Drawing dies-blank diameter, drawing force.

Module VI: Jigs and Fixture design

Important considerations in jig and fixture design, Locating and clamping, principles for location purposes, principles for clamping purposes, design principles for jigs and fixtures.

Evaluation:

Components	Internal Assessment	Attendance	MTE	ESE
Weightage (%)	30	5	15	50

Text & References:

Text:

- A Bhattacharya , "Metal cutting theory& practice", C.B. Publication

References:

- Geoffrey Boothroyd, "Fundamentals of Metal Machining & Machine Tools", Tata McGraw Hill Kogakusha
- P.N. Rao, "Manufacturing Technology", Tata McGraw Hill Publication Ltd.
- Dr. P.C. Pandey & C.K. Singh. "Production Engg. Sciences", Standard Publisher. Distributors.
- Dr. B.J. Ranganath, "Metal Cutting & Tool Design" Vikas Publishing House Pvt. Ltd.

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AMITY SCHOOL OF ENGINEERING TECHNOLOGY (ASET)

THERMAL SCIENCE & ENGINEERING PROCESS

Course Code: BME- 510 **L:2 T:1 C:3**

Course Objective:
Thermal Science and Engineering is a field that deals with the study of heat and heating effects in different conditions. These effects might be enclosed in a room or an open environment. When it comes to the study of Thermal Science and Engineering, a student needs to learn a lot of things. Thermodynamics, heat transfer, heating effects, fluid mechanics, and many more.

Course Contents:

Module I: REVIEW OF THERMODYNAMIC LAWS AND COROLLARIES: Transient flow analysis, Second law thermodynamics, Entropy, Availability and unavailability, Thermodynamic potential. Maxwell relations, Specific heat relations, Mayer's relation, Evaluation of thermodynamic properties of working substance.

Module II: FINITE DIFFERENCE METHODS FOR CONDUCTION: ID & 2D steady state and simple transient heat conduction problems-implicit and explicit methods. Forced Convection: Equations of fluid flow-concepts of continuity, momentum equations-derivation of energy equationmethods to determine heat transfer coefficient: Analytical methods-dimensional analysis and concept of exact solution. Approximate method-integral analysis.

Module III: VISCOUS FLOW: Derivation of Navier-Stoke's Equations for viscous compressible flow – Exact solutions to certain simple cases: Plain Poisoulle flow - Coutte flow with and without pressure gradient - Hagen Poisoulle flow - Blasius solution.

Module IV: POWER CYCLES: Review binary vapour cycle, co generation and combined cycles, Second law analysts of cycles. Refrigeration cycles, Thermodynamics off irreversible processes, Introduction, Phenomenological laws, Onsaga Reciprocity relation, Applicability of the Phenomenological relations, Heat flux and entropy production, Thermodynamic phenomena, Thermo electric circuits.

Module IV: GAS DYNAMICS: Fundamental thermodynamic concepts, isentropic conditions, mach numbers and area, Velocity relations, Dynamic Pressure, Normal shock relation for perfect gas, Supersonic flow, oblique shock waves, Normal shock recoveries, detached shocks, Aerofoil theory.

Evaluation: Components	Other Components	Attendance	MTE	ESE
Weightage (%)	30	5	15	50

REFERENCES:

1. Basic and Applied Thermodynamics/ P.K.Nag/ TMH
2. Element of Gas Dynamics/Yahya/TMH
3. Fluid Mechanics and Machines/Modi and Seth/Standard Book House
4. Thermodynamics/Sonnatag & Van Wylen / John Wiley & Sons
5. Thermodynamics for Engineers/Doolittle-Messe / John Wiley & Sons
6. Heat Transfer/ P.K.Nag /TMH
7. Thermal Engineering / Soman / PHI
8. Thermal Engineering / Rathore / TMH
9. Engineering Thermodynamics/Chatopadyaya/

MECHANICS OF METAL CUTTING LAB

Course Code: **BME 522** **P:02 C:01**

Course Contents:

Name of

Experiments:

1. Step and taper turning on lathe machine
2. To make a hexagonal headed bolt on a milling machine.
3. To make a job on a shaper.
4. To study the Kinematics design of workshop machines.
5. To make a job on drilling machine as per given specifications.
6. To measure cutting forces on a single point cutting tool
7. To measure cutting parameters for multipoint cutting tool.
8. Study of a punch and die set.
9. Study of a jig and fixture.
10. Fixture fabrication with case study.
11. Study of formation of chips during turning and shaping operations on samples of C.I., M.S., Brass, Cu & aluminum.
12. Determination of the life of the cutting tool used on lathe for various cutting speeds, feeds and different work piece materials.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	20	20	5	25	25

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

HEAT TRANSFER LAB

Course Code: BME 523 **P:02 C:01**

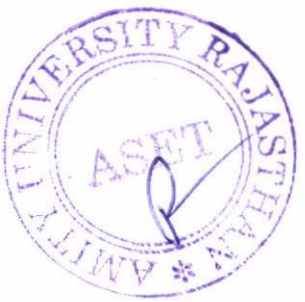
Course Contents:

1) To determine the surface heat exchanger for a vertical tube losing heat by natural convection.
2) To observe pool boiling phenomena and to determine the critical heat flux at different bulk temperature.
3) To determine Stefan Boltzmann constant.
4) To analyse the performance of an a existing multi-pass heat exchanger and calculate overall heat transfer coefficient.
5) To compare overall heat transfer coefficient for parallel and counter flow in a double pipe heat exchanger and compare practical value overall heat transfer coefficient with theoretical value
6) To determine the overall thermal conductivity of composite wall and to check that the thermal resistance in composite wall are connected in series.
7) To determine the specific heat of Air by forced convection.
8) To determine the inside and outside heat transfer co-efficient of drop wise and film wise condensation and to study the drop wise and film wise condensation phenomena.
9) To find the Emissivity of a given test plate with respect to the black plate

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	20	20	5	25	25

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.



FLUID POWER SYSTEMS

Course Code: **BME 612** **L:2,T:1, C:3**

Course Objective:

Fluid power systems cover generation, transmission, and control applications of power by using pressurized fluids. This course imparts the knowledge of different fluid power systems (pneumatic and hydraulic) which are used in industries and hydro power plants.

Course Contents:

Module I: Introduction

Euler's equations for turbo machines; impulse and reaction forces due to fluid systems on stationery and moving
system of vanes; jet propulsion.

Module II: Water & Gas Turbines

Classification: Pelton, Francis, Propeller and Kaplan turbines; velocity triangles; efficiency; draft tubes, governing. General aspect of gas turbine, Jules cycle, Brayton cycle, classification, merits of gas turbine, open- cycle gas turbine, closed cycle gas turbine, Inter cooling, Reheating, Re-generation in gas turbine.

Module III: Pumps

Centrifugal pumps, velocity triangles, efficiency, turbine pumps, axial and mixed flow pumps.

Module IV: Fluid Machines

Similarity laws applied to roto dynamic machines; specific speed, unit quantities; characteristic curves; use of models; cavitations and attendant problems in turbo machines; selection of turbines hydroelectric plants.

Module V: Hydraulic Power Transmission

Transmission of hydraulic power through pipe lines; water hammer; precautions against water hammer in turbine and pump installations.

Module VI: Fluid Systems

Hydraulic press, hydraulic accumulator, Hydraulic intensifier, Hydraulic ram, Hydraulic lift, Hydraulic crane, Positive pumps ,gear , fluid coupling and torque converter, Pneumatic Power: comparison of pneumatic and hydraulic Systems.

Evaluation:

Components	Internal	Attendance	MTE	ESE
Weightage (%)	30	5	15	50

Text & References:

Text:

- Gupta, S. C., Fluid Mechanics and Hydraulic Machines, Pearson Education, 2007
- R.K. Bansal, "Fluid Mechanics & Hydraulic Machines", Laxmi Publications (P) Ltd., 2002.

References:

- Dr. D.S. Kumar, "Fluid Mechanics & Fluid Power Engineering", S.K. Kataria & Sons,2001
- D.R. Malhotra & N.K. Malhotra, "The Fluid Mech. & Hydraulics", Satya Prakashan, 2001
- V.P. Gupta, Alam Singh, Manish Gupta, "Fluid Mechanics, Fluid Mechanics & Hydraulics", CBS Publishers; 1999.

INDUSTRIAL SAFETY

Course Code: BME 635 **L:03,T:00,C:03**

Course Objective:

The objective of this course is to study the safety importance, safety risks, to understand the principles of machine guarding and operation of protective devices, to impart knowledge of safety rules and regulations, standards and codes applicable for engineering industry and to develop the knowledge related to health and welfare measures in engineering industry.

Course Contents:

Module I: Introduction: Evolution of modern safety concepts, Fire prevention, Mechanical hazards – Boilers, Pressure vessels, Electrical Exposure, Chemical exposure, Toxic materials, Industrial Hygiene, Safety in Operations of Hazardous Machines – Safety in welding and gas cutting – Safety in cold forming and hot working of metals – Work Permits for hot Work and Cold Work – Safety of Pressure vessels – Safety in inspection and testing – Safety in radiography.

Module II: Hazard analysis

Understanding of Hazards and Risks – Risk Assessment Techniques – Accident Investigation Reporting and Analysis Techniques – Measurement and Control of Performances. Hazard analysis techniques and measurements.

Module III: Environmental Safety

Health and welfare measures in engineering industry-pollution control in engineering industry-industrial waste disposal, Environmental Control, Industrial Noise, Noise measuring instruments, Control of Noise, Vibration, Personal Protection. Explosions – Disaster management – catastrophe control, hazard control,

Module IV: Safety Regulations

Safety in Workplace – Plant / Work area Design – Hand tools and Portable power tools – Manual and Mechanical Material Handling – Ergonomics – Machine Guarding – Storage of Materials, Safety education and training - Factories Act, Safety regulations Product safety – case studies.

Evaluation:

Components	Other Components	Attendance	MTE	ESE
Weightage (%)	30	5	15	50

Text & References:

- Philip Hagan "Accident Prevention Manual for Business and Industry", N.S.C. Chicago, 13th edition, 2009.
- "Occupational safety Manual" BHEL, Trichy, 1988.
- "Krishnan N.V. "Safety Management in Industry" Jaico Publishing House, Bombay, 1997.
- "The Indian boilers act 1923 with amendments", Law Publishers (India) Pvt. Ltd., Allahabad.
- "Health and Safety in Welding and Allied processes", Welding Institute, UK, High Tech. Publishing Ltd., London, 1989.
- "Safe use of wood working machinery", HSE, UK, 2005. "ISO 14020:2000 Environmental Labels and Declarations-General Principles", ISO, 2000.

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SUSTAINABLE ENGINEERING

Course Code: BME 636 **L:03,T:00,C:03**

Course Objective:

Objective of this course is to inculcate in students an awareness of environmental issues and the global initiatives towards attaining sustainability. The student should realize the potential of technology in bringing in sustainable practices

Course Contents:

Module I: – Introduction – Sustainability: Introduction, concept, evolution of the concept; Social, environmental and economic sustainability concepts; Sustainable development, Nexus between Technology and Sustainable development; Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs), Clean Development Mechanism (CDM).

Module II: Environmental Pollution: Air Pollution and its effects, Water pollution and its sources, Zero waste concept and 3 R concepts in solid waste management; Greenhouse effect, Global warming, Climate change, Ozone layer depletion, Carbon credits, carbon trading and carbon foot print, legal provisions for environmental protection.

Module III: Environmental management standards: ISO 14001:2015 frame work and benefits, Scope and goal of Life Cycle Analysis (LCA), Circular economy, Bio-mimicking, Environment Impact Assessment (EIA), Industrial ecology and industrial symbiosis. Resources and its utilisation: Basic concepts of Conventional and non-conventional energy, General idea about solar energy, Fuel cells, Wind energy, Small hydro plants, bio-fuels, Energy derived from oceans and Geothermal energy

Module IV: Sustainability practices: Basic concept of sustainable habitat, Methods for increasing energy efficiency in buildings, Green Engineering, Sustainable Urbanisation, Sustainable cities, Sustainable transport.

Evaluation:

Components	Other Components	Attendance	MTE	ESE
Weightage (%)	30	5	15	50

Text & References:

- Allen, D. T. and Shonnard. D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
- Bradley. A.S; Adebayo,A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning
- Environment Impact Assessment Guidelines, Notification of Government of India, 2006
- Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998
- ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-Rating System, TERI Publications - GRIHA Rating System
- Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.
- Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English Language Book Society (ELBS).
- Purohit, S. S., Green Technology - An approach for sustainable environment, Agrobios Publication

FLEXIBLE MANUFACTURING SYSTEM

Course Code: BME 637 **L:03,T:00,C:03**

Introduction: FMS definition and classification of manufacturing systems, Automated production cycle, Need of flexibility, Concept of flexibility, Types of flexibilities and its measurement.

FMS Equipment: Why FMS, Factors responsible for the growth of FMS, FMS types and applications, Economic justification for FMS, Functional requirements for FMS equipments, FMS processing and QA equipment, e.g., turning and machining centres, Co-ordinate measuring machines, Cleaning and debarring machines, FMS system support equipment, Automated material handling and storage equipment, cutting tool and tool management, Work holding considerations, Fixture considerations in FMS environment.

Group Technology: GT concepts, Advantages of GT, Part family formation-coding and classification systems; Part-machine group analysis, Methods for cell formation, Use of different algorithms, mathematical programming and graph theoretic model approach for part grouping, Cellular vs. FMS production.

FMS related problem and Solution Methodology:

FMS design problems: Part assignment, Machine selection, Storage system selection, Selection of pallets and fixtures, Selection of computer hardware and software, designing for layout integration of machine storage, Material handling System and computer system, Communication networks.

FMS planning problems: Strategic planning, Part type selection, Machine grouping, production ratio and resource allocation, Machine loading problems.

Operational & Control problems: Part scheduling, Machines robots & AGVS, Process monitoring & control.

FMS Implementation: Objectives, acceptance testing, Performance goals and expectation maintenance concerns.

Evaluation:

Components	Other Components	Attendance	MTE	ESE
Weightage (%)	30	5	15	50

Books:

1. Automation, Production System & Computer Integrated Manufacturing Groover Englewood
2. Design and Operation of SMS Rankey IFS
3. Flexible Manufacturing System Wernecks Spring-Verlag
4. FMS in Practice Bonctto Northox Ford
5. Flexible Manufacturing Cells and systems W.W. Luggen Prentice Hall India
6. Performance Modelling of Automated Manufacturing Systems Vishwanathan & Narahari Prentice Hall India

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FLUID POWER SYSTEMS LAB

Course Code: **BME 623** **P:2, C:01**

Course Contents:

- To conduct a test on Centrifugal Pump and plot its characteristics
- To Plot the characteristics of Pelton turbine.
- To conducts an experiment on Francis turbine.
- To study the effect of a draft tube on reaction turbines.
- To find the friction factor for flow through pipes
- To study the hydraulic controls rig.
- To conduct an experiment for verifying model laws.
- To study the cavitations phenomenon in turbines.
- Study of hydraulic couplings and torque converters.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	20	20	5	25	25

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Modelling and Simulation Lab

Course Code: **BME 625** **P:02 C:01**

Course Outcome:

Students will get an insight into the use of different simulation and analysis software (viz. PRO/E, CATIA, ANSYS, MSC / Nastran) to simulate flow behaviour and perform Structural analysis.

Course Contents:

1) Design and drafting of riveted joints
2) Design and drafting of welded joints.
3) Layout of typical wing structure.
4) Stress analysis of a rectangular plate with a hole.
5) Static analysis on cantilever beam
6) Static analysis of forces in a simply supported beam
7) Static analysis- Plane truss
8) 2-D static stress analysis
9) 3-D static stress analysis
10) Three view diagram of a typical aircraft
11) Analysis of a model airplane wing
12) Simulation of flow through a Converging-diverging nozzle.
13) Structural analysis of a tapered wing
14) Stress and modal analysis of a cylinder under pressure
15) Stress distribution in indeterminate structure

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	20	20	5	25	25

Note: IA –Internal Assessment, EE- External Exam, PR- Practical Record

COMPOSITE MATERIALS

Course Code: BME 711 **L:03,T:00,C:03**

Course Objective:

The course covers properties of fibre-reinforced polymer composites and the mechanical performance of laminated composites, including failure behaviour. Students will be able to model, simulate and optimise the performance of composite structures as well as develop practical skills in one or more common manufacturing techniques.

Course Contents:

Module I: Introduction: Classifications of Engineering Materials, Concept of composite materials, Matrix materials, Functions of a Matrix, Desired Properties of a Matrix, Polymer Matrix (Thermosets and Thermoplastics), Metal matrix, Ceramic matrix, Carbon Matrix, Glass Matrix etc.

Module II: Types of Reinforcements/Fibers: Role and Selection or reinforcement materials, Types of fibres, Glass fibers, Carbon fibers, Aramid fibers , Metal fibers, Alumina fibers, Boron Fibers, Silicon carbide fibers, Quartz and Silica fibers, Multiphase fibers, Whiskers, Flakes etc., Mechanical properties of fibres. Material properties that can be improved by forming a composite material and its engineering potential

Module III: Various types of composites: Classification based on Matrix Material: Organic Matrix composites, Polymer matrix composites (PMC), Carbon matrix Composites or Carbon-Carbon Composites, Metal matrix composites (MMC), Ceramic matrix composites (CMC); Classification based on reinforcements: Fiber Reinforced Composites, Fiber Reinforced Polymer (FRP) Composites, Laminar Composites, Particulate Composites, Comparison with Metals, Advantages & limitations of Composites

Module IV: Fabrication and Testing of Composites: Processing of Composite Materials: Overall considerations, Autoclave curing, Other Manufacturing Processes like filament welding, compression molding, resin-transplant method, pltrusion, pre-peg layer, Fiber-only performs, Combined Fiber-Matrix performs, Manufacturing Techniques: Tooling and Specialty materials, Release agents, Peel plies, release films and fabrics, Bleeder and breather plies, bagging films, Mechanical testing of composites, tensile testing, Compressive testing, Intra-laminar shear testing, Inter-laminar shear testing, Fracture testing etc.

Evaluation:

Components	Other Components	Attendance	MTE	ESE
Weightage (%)	30	5	15	50

Text & References:

- Materials characterization, Vol. 10, ASM hand book
- Mechanical Metallurgy by G. Dieter Mc-Graw Hill
- Thermal Analysis of Materials by R.F. Speyer, Marcel Decker
- Engineering Materials: Polymers, Ceramics and Composites A.K Bhargava Prentice Hall India

GREEN VEHICLE TECHNOLOGY

Course Code: BME710 **Credit Units: 03**

Course Objective:

This course introduces the fundamental concepts, principles, analysis and design of hybrid and electric vehicles. This course aims to cover different configurations of electric vehicles, hybrid vehicle configuration and its components, performance analysis, drive systems and testing of electric vehicles.

Course Contents:

Module I - Introduction

Overview of green vehicles in India. Benefit of using green vehicles. Economic and environmental impact of electric hybrid vehicle. Comparison of hybrid electric vehicles and conventional vehicles. Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics.

Module II -Hybrid and Electric Drive-trains

Hybrid Electric Drive-trains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis. Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

Module III-Propulsion System

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

Module IV- Energy Storage System

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. .

Module V- Testing of Electric Vehicles

Homologation & its Types, Regulations overview (EEC, ECE, FMVSS, AIS, CMVR), Type approval Scheme. Types of test tracks, Hardware in The Loop (HIL) concepts for EV/HEVs. static testing of vehicle, dynamics testing of vehicle, vehicle component testing.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	30	50

Text:

- Mehrdad Ehsani, Yimin Gao, Stefano Longo and Kmbiz Ebrahimi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles", CRC Press, 3rd edition (2019)
- A.K. Babu, "Electric & Hybrid Vehicles".Khanna Publishing, 1st edition (2019).
- Tom Denton, "Electric and Hybrid Vehicles", Routledge; 1st edition (2016).

ARAI Standards for Electric Vehicles (https://www.araiindia.com/downloads

Finite Element Methods

Course Code: BME 712 **L:03,T:00,C:03**

Course Objective:

Students should possess a good understanding of the theoretical basis of the Finite Element Method. Students will be able to implement the Galerkin residual weak formulation into the Finite Element Method for the solution of Ordinary and Partial Differential Equations. To be able to communicate effectively in writing to report (both textually and graphically) the method used, the implementation and the numerical results obtained.

Course Contents:

Module 1:

Introduction to Finite Element Methods, General Description of Methods, Brief Explanation of FEA for a stress analysis problem, Finite element method vs. classical method, History of FEM, Need of FEM.

Module 2:

Element shapes, nodes, Nodal unknown and coordinate systems, Matrix displacement formulation, Strain displacement matrix, Basic equations in elasticity.

Module 3:

Shape functions, Assembling stiffness equation-direct approach, Virtual work method, Variational methods, Rayleigh-Ritz Method,

Module 4

Finite Element Analysis: Bars and Trusses, Plain stress problems, Plain Strain Problems, Matrix algebra and Gaussian Eliminations, Conjugate Gradient method for problem solving.

Examination Scheme:

Components	Internal Assessment	Attendance	MTE	ESE
Weightage (%)	30	5	15	50

Text Books and References:

1. P.Seshu, "Text Book of Finite Element Analysis", Prentice-Hall of India Pvt. Ltd., New Delhi, 2007. ISBN-978-203-2315-5
2. Chandrupatla T.R., and Belegundu A.D., "Introduction to Finite Elements in Engineering", Pearson Education 2002, 3rd Edition.
3. Rao S.S., "The Finite Element Method in Engineering", Pergammon Press, 1989
4. David V Hutton "Fundamentals of Finite Element Analysis"2004. McGraw-Hill Int. Ed.
5. J.N.Reddy, "An Introduction to the Finite Element Method", McGraw-Hill International Editions (Engineering Mechanics Series), 1993. ISBN-0-07-051355-4

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ADVANCED MACHINING METHODS

Course Code: **BME 800** **Credit Units: 03**

Course Objective:

The aim of the course is to provide the students with the understanding of the basic principles underlying the design, analysis, and synthesis of robotic systems plus machine vision technology in automation. In particular, the course will start from simple problem in transformations, kinematics and inverse kinematics, dynamics and control. Later in the semester more complex problems in sensing, force control, mobile robots and robot programming will be discussed.

Course Contents:

Module I: Kinematics Analysis of Robot
Matrix algebra or coordinate transformation, kinematics analysis; geometric and dynamic analysis of robot manipulators.

Module II: Robot Control
Robot Control, RobotVision, RobotControlled, CNNC, Pathplanning, Obstruction Avoidance

Module III: Material Handling
Computer aided Materials Management-inventory control, materials requirements planning. Computer Controlled parts handling and equipments.

Module IV: Automation Protocol
Manufacturing Automation protocol, cross functional implementation Technology for system integration.

Examination Scheme:

Components	Internal Assessment	Attendance	MTE	ESE
Weightage (%)	30	5	15	50

Text & References:

Text:

- Raghuvanshi, Manufacturing Process.
- P.N. Rao, Manufacturing Technology, TMH publications

References:

- Hazra-Chowdhary , Workshop Technology
- R.K. Jain, Production Engineering

ALTERNATIVE SOURCES OF ENERGY

Course Code: BME 807 **L:03, T:00, C:03**

Course Objective:

This course envisages the new and renewable source of energy, available in nature and to expose the students on sources of energy crisis and the alternates available, also stress up on the application of non-conventional energy technologies.

Course Contents:

Module I: Introduction
Energy source, India's production and reserves of commercial energy sources, need for non-conventional energy sources, energy alternatives, solar, thermal, photovoltaic. Water power, wind biomass, ocean temperature difference, tidal and waves, geothermal, tarsands and oil shale, nuclear (Brief descriptions); advantages and disadvantages, comparison (Qualitative and Quantitative).

Module II: Solar Thermal Conversion: Collection and storage, thermal collection devices, liquid flat plate collectors, solar air heaters concentrating collectors (cylindrical, parabolic, paraboloid) (Quantitative analysis); sensible heat storage, latent heat storage, application of solar energy water heating. Space heating and cooling, active and passive systems, power generation, refrigeration. Distillation (Qualitative analysis) solar pond, principle of working, operational problems.

Module III: Wind Energy: Properties of wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, wind machines; Types of wind machines and their characteristics, horizontal and vertical axis wind mills, elementary design principles; coefficient of performance of a wind mill rotor, aerodynamic considerations of wind mill design, numerical examples.

Module IV: Geothermal and Tidal Energy: Geothermal Energy Conversion : Principle of working, types of geothermal station with schematic diagram, geothermal plants in the world, problems associated with geothermal conversion, scope of geothermal energy.
Tides and waves as energy suppliers and their mechanics; fundamental characteristics of tidal power, harnessing tidal energy, limitations. Ocean Thermal Energy Conversion : Principle of working, Rankine cycle, OTEC power stations in the world, problems associated with OTEC.

Module V: Energy from Biomass: Photosynthesis, photosynthetic oxygen production, energy plantation, bio gas production from organic wastes by anaerobic fermentation, description of bio-gas plants, transportation of bio-gas, problems involved with bio-gas production, application of bio-gas, application of bio-gas in engines, advantages.

Evaluation:

Components	Other Components	Attendance	MTE	ESE
Weightage (%)	30	5	15	50

Text & References:

- Non-Convention Energy Resources B H Khan McGraw Hill Education (India) Pvt. Ltd. 3rd Edition
- Solar energy Subhas P Sukhatme T ata McGraw Hill 2nd Edition, 1996.
- Non-Conventional Energy Sources G.D Rai Khanna Publishers 2003

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RELIABILITY & MAINTENANCE

Course Code: **BME 808** **L:03 C: 03**

Unit 1 Basic Concepts of Reliability: Probability distributions used in maintenance engineering- Binomial, Poisson, Exponential, Normal, Log-normal, Gamma and Weibull distribution; failure rate, hazard rate, failure modes, MTTR, MTBF, MTTF.

Unit 2 System Reliability Models: System reliability-component series systems, mcomponent parallel systems and combined system; standby systems; K-out-of-m systems; redundancy techniques in system design; event space, decomposition (Key Stone), cut and tie sets, Markov analysis, reliability and quality, unreliability, maintainability, availability.

Unit 3 Maintenance Concepts and Strategies: Introduction, maintenance functions and objectives, maintenance planning and scheduling, maintenance organization. General Introduction to Maintenance Types: Breakdown, emergency, corrective, predictive, and preventive; maintenance prevention; design-out maintenance, productive maintenance, shutdown maintenance and scheduled maintenance.

Unit 4 Condition Based Maintenance: Principles of CBM, pillars of condition monitoring, CBM implementation and benefits; condition monitoring techniques- visual monitoring, vibration monitoring, wear debris monitoring, corrosion monitoring, performance monitoring.

Unit 5 Reliability Centered Maintenance (RCM):- Concept, methodology, benefits; Total Productive Maintenance: Evolution of TPM, TPM objectives, concept, pillars of TPM. Failure Modes and Effects Analysis (FMEA)/ Failure Modes, Effects and Criticality Analysis (FMECA): Overview, elements of FMECA, applications and benefits, risk evaluation, risk priority numbers, criticality analysis, process FMEA, qualitative and quantitative approach to FMECA; design FMEA and steps for carrying out design FMEA.

Evaluation:

Components	Internal Assessment	Attendance	MTE	ESE
Weightage (%)	30	5	15	50

References Books:

1. Ebeling CE; An Introduction To Reliability & Maintainability Engg; TMH
2. Srinath L.S; Reliability Engineering; East West Press.
3. Naikan; Reliability engg and life testing; PHI
4. Kapur KC and Lamberson LR; Reliability in Engineering Design; Wiley India
5. Telang AD and Telang A; Comprehensive Maintanance Management; PHI
6. Mishra R.C; Reliability and Maintenance Engineering; New age International publisher.
7. Balaguruswamy; Reliability Engg;

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ELEMENTS OF MECHANICAL ENGINEERING

Course Code: BME 104 **L:3, C:03**

Course Objective:

The objective of this course is to impart the basic knowledge of thermodynamics, stress- strain, materials & their properties and various manufacturing processes to the students of all engineering discipline.

Course Contents:

Module I: Materials: Classification of engineering material and their mechanical properties,Stress-strain diagram, Hooks law and modulus of elasticity.

Module II: Measurement:
Introduction to Vernier caliper, micrometer, dial gauges, slip gauges, sine-bar.

Module III: Mechanical Machines:
Introduction to Lathe, Drilling, Milling and Shaping machines, NC machine, CNC machine and DNC machine..

Module IV: Fluids: Fluid properties, pressure, density and viscosity, viscous and turbulent flow, working principle of pumps.

Module V: Thermodynamics:
First and second law of thermodynamics; Formation of steam, steam properties, classification and working of boilers,Refrigeration and Refrigerants

Module VI: I. C. Engines:
Construction, Nomenclature; working of two stroke & four stroke petrol & diesel IC engines, Carnot cycle and ideal efficiency; Otto and diesel cycles, Hybrid engines.

Module VII: Introduction to Fabrication Processes
Casting Process, Welding & allied process, Forging process.

Evaluation:

Components	Assignment	Viva	MTE	Attendance	ESE
Weightage (%)	15	15	15	5	50

Text & References:

- S Trymbaka Murthy (2011) Elements of Mechanical Engineering- I K International Publishing House Pvt. Ltd;
- R.K. Rajput (, 2005) Elements of Mechanical Engineering- Firewall Media
- P.K. Nag,(2005) Engineering thermodynamics- Tata McGraw-Hill Education,
- Automation, Productions systems, and computer Integrated manufacturing by Mikell P. Groover

ENGINEERING MECHANICS

Course Code: BME 204 **L:3, C:03**

Course Objective:

Objective of this course is to provide fundamental knowledge of force system and its effect on the behaviour of the bodies that may be in dynamic or in static state. It includes the equilibrium of different structures like beams, frames, truss etc and the force transfer mechanism in the different components of a body under given loading condition.

Course Contents:

Module I: Force system & Structure
Free body diagram, Equilibrium equations and applications,Parallelogram Law of forces, Lami's Theorem, Plane truss, perfect and imperfect truss.

Module II: Friction
Static and Kinetic friction, laws of dry friction, co-efficient of friction, angle of friction, angle of repose, cone of friction, friction lock, efficiency of screw jack.

Module III: Distributed Force
Determination of center of gravity, center of mass and centroid, area moment of inertia, radius of gyration, parallel axis theorem, perpendicular axis theorem, polar moment of inertia.

Module IV: Stress Strain Analysis
Simple stress and strain: introduction, normal shear, and stresses-strain diagrams for ductile and brittle materials. Elastic constants, Strain Energy, Properties of material-strength, elasticity, stiffness, malleability, ductility, brittleness, hardness and plasticity etc; Concept of stress and strain.

Examination Scheme:

Components	Assignment	Viva	MTE	Attendance	ESE
Weightage (%)	15	15	15	5	50

Text & References:

- D.S. Kumar (2009) Engineering Mechanics – S. K. Kataria & Sons
- Dr. R.K. Bansal (2008) Engineering Mechanics – Laxmi Publication
- J. L. Meriam, L. G. Kraige (2012) Engineering Mechanic-Don Fowley
- Timoshenko, Engineering Mechanics, McGraw Hill
- R. S. Khurmi, Engineering Mechanics, S. Chand Publication
- H. Shames & G. K. M. Rao, Engineering Mechanics, Pearson Education, 2006

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ENGINEERING GRAPHICS

CourseCode: **BME205** **L:01 C:01**

Course Contents:

Module 1:Scales &Curves
Representative factor, Plain Scales, Diagonal Scales, ComperativeScales and Scale of chords.Constructionof ellipse, Parabola, Hyperbola,Cycloid,Epicycloid,Hypocycloid, Involutesand Spirals by various methods.

Module 2:Projection ofPoints &Straight lines
Projectionof points, Projectionof straightlines.True inclinationsandtrue lengthof straight lines.

Module 3:Projection of planes andsolids
Projectionof circle, triangle, polygons,polyhedrons,pyramids,cylinders andconesin different positions.

Module 4:Introduction to Auto CAD
Auto CAD, Tools and commands, Construction of curves and special curves via auto cad

Examination Scheme:

Components	Internal Assessment	Attendance	MTE	ESE
Weightage(%)	30	5	15	50

MTE-Mid-termExamination

Text &References:

- EngineeringGraphics–BasantAgrawalandDr.C.M.Agrawal,TataMcGraw-HillPublishing Company Ltd.
- EngineeringDrawing–byN.D. Bhatt
- EngineeringDrawingandGraphics– by Veenugopal
- EngineeringDrawing–byT.Jeyopoovan

THERMODYNAMICS

Course Code: BTM 302 **L:2,T:1, C:03**

Course Objective:

Objective of this course is to impart in depth understanding of the principles of thermodynamics and heat transfer. This course also helps students understand the application of basic fluid mechanics, thermodynamic, and heat transfer principles and techniques, including the use of empirical data, to the analysis of representative fluid and thermal energy components and systems encountered in the practice of electrical, electronic, industrial,and related disciplines of engineering.

Course Contents:

Module I: Basic concepts of thermodynamics

Thermodynamic system, intensive and extensive properties, cyclic process, Zeroth Law of Thermodynamics,Work and heat, Flow work,First law of thermodynamics, Mechanical equivalent of heat, internal energy,Analysis of non-flow system, flow process and control volume, steady flow, energy equation, flow processes **Module II: Second Law of Thermodynamics and Entropy**

Heat Engine, heat pump, Kelvin Planck and Clausius statement of Second Law of Thermodynamics, Perpetual motion machine, Reversible cycle- Carnot Cycle, Clausius inequality, entropy, Principle of entropy increase, concepts of availability, irreversibility, Carnot theorem, Max-well-relation,

Module III: Thermodynamic Cycles

Assumstion for air cycle, carnot-cycle, Ericsson-cycle, Strilling-cycle, otto-cycle, Diesel-cycle, Dual-cycle, Brayton- cycle, Rankine-cycle, vapour-compression cycle, bell-Coleman cycle.

Module IV: Pure steam & its properties

Use of steam tables, wet steam, superheat steam, thermodynamics property of pure in solid, homogeneous and heterogeneous system, pure substance condition, sensible and latent heat, p-v-T behaviour of pure substance, Mollie diagram, dryness fraction, critical point, triple point

Module V : Compressors

Introduction,Types of compressors, Isothermal efficiency, adiabatic efficiency, clearance volume, volumetric efficiency, and multi-stage compression with intercooling.

Evaluation:

Components	Internal Assessment	Attendance	MTE	ESE
Weightage(%)	30	5	15	50

Text & References:

Text:

- P.K. Nag, "Engineering Thermodynamics", Tata McGraw Hill
- Incropera, "Engineering Thermodynamics", John Willy

References:

- Engel, T. and Reid, P., Thermodynamics, Statistical Thermodynamics & Kinetics, Pearson Education, 2006
- Cengel & Boles, "Thermodynamics", Tata McGraw Hill.
- Sonntag/Vanhylene, Fundamentals of Thermodynamics, Wiley
- Rahul Gupta, Engineering Thermodynamics, Asian Books P. Ltd.
- Y.V.C. Rao, Engineering Thermodynamics, Khanna Publications
- Onkar Singh, Applied Thermodynamics, New Age Publications.
- Dhomkundwar Kothandaraman, "A Course in Thermal Engineering", Dhanpat Rai Publications

MECHANICS OFSOLIDS

CourseCode: **BME303** **L:02,T:01,C:03**

CourseObjective:

Theobjectiveofthiscourse istomakethestudentsunderstandtheconceptofstress andstrainin differenttypes ofstructure/machineunderdifferentloadingconditions.Thecoursealsocoversthesimpleandcompound stresses duetoforces,stressesanddeflection inbeamsduetobending,torsionincircular section,strainenergy, different theories offailure,stressinthincylinderthickcylinderandspheres duetoexternalandinternal pressure.

CourseContents:

ModuleI: Simplestressesandstrains:

Conceptof stressandstrain;Hooke'slaw, Young'smodulus,Poissonratio,stressatapoint,stressandstrains in barssubjectedtoaxialloading.Modulusofelasticity,stress producedincompoundbarssubjecttoaxialloading. Temperature stressandstraincalculationsduetoapplicationsofaxialloadsandvariationoftemperaturein singleandcompoundwalls.

ModuleII:Compoundstressandstrains:

Thetwodimensionalsystem;stressatapointonaplane,principalstressesandprincipalplanes;Mohr'scircle ofstress.Graphical andAnalytical methods forstressesonobliquesectionofbody.Shearforceandbending momentdiagramsforcantilever,simplysupportedandoverhangingbeams.

ModuleIII:Bending&ShearStress:

Theoryofbendingstressesinbeamsduetobending,assumptions inthesimplebendingtheory,derivationof formula:itsapplicationto beamsofrectangular,circular andchannel sections,compositebeams, Shearstress in symmetricandUnsymmetricsections,bendingandshear stressesincompositebeams.

ModuleIV: Torsion&Spring:

Derivationoftorsionequationanditsassumptions.Applicationsoftheequationofthe hollowandsolidcircular shafttorsional rigidity,combinedtorsionandbendingofcircularshafts,principalstressandmaximum shear stressundercombinedloadingofbendingandtorsion,analysisofclose-coiled-helicalsprings.

ModuleV:Thincylindersandspheres:

Derivationofformulaeandcalculationofhoopstress,longitudinalstressinacylinderandspheresubjectedto internalpressure.

ModuleVI:Columnsandstruts:

Columnsandfailure ofcolumns,Euler'sformulas;Rankine-Gordon'sformula, Johnson'sempiricalformulafor axiallyloadedcolumnsandtheirapplication
s.

Module VIII : Bending of curved beams

calculation of stress in crane and chains hooks, rings of circular section and trapezoidal section .

Evaluation:

Components	Internal Assessment	Attendance	MTE	ESE
Weightage(%)	30	5	15	50

Text &References:

- JindalU.C.,"StrengthofMaterials",GalgotiaPublication,NewDelhi,1998.
- RyderG.H.,"StrengthofMaterials",Macmillan,Delhi,2003.
- R.K.Bansal,"StrengthofMaterials",LaxmiPublication,NewDelhi,2001.
- SadhuSingh,"StrengthofMaterials",KhannaPublishers,NewDelhi,2000.
- TimoshenkoS.P.,"ElementsofStrengthofMaterials",East-Westaffiliated,NewDelhi,2000.

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AMITY SCHOOL OF ENGINEERING TECHNOLOGY (ASET)

MECHANICS OF SOLIDS LAB

Course Code: **BME 323** **P:02 C:01**

Course Contents:
Experimental work will be based on the paper of Mechanics of Solids.

List of Experiments:
1. Tensile Test (MS)
2. Double Shear Test (MS)
3. Compression Test (CI)
4. BrinellHardness No.
5. Izod Impact
6. Testing Machine
7. Rockwell Hardness Tester
8. Spring Stiffness (Spring Compression Testing machine)
9. Torsion testing machine

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	20	20	5	25	25

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva

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FLUID MECHANICS

CourseCode: BME402 **L:02,T:01,C:03**

CourseObjective:

TheobjectiveofFluidMechanicssubjectisthatstudentsshouldunderstandthe,propertiesoffluids,pressure measurementdevices,hydraulicforceson surfaces,bouncyandflotationinfluids,kinematicsandstatic behaviouroffluids,dimensionandmodelanalysis,laminarandturbulentflow,flowthroughpipesandorifices, boundarylayertheory.

CourseContents:

ModuleI: FluidPropertiesandFluidStatics

NewtonianandNon-Newtonian Fluids;Viscosity;Incompressible andcompressiblefluids,compressibility. Forces onplanesurfaces, forcesoncurvedsurfaces, buoyant forces,andstability offloating bodies,metacentre andmetacentreheight.

ModuleII:KinematicsofFluidMotion

Steadyandunsteadyflow; uniformandnon-uniformflow;Laminarandturbulentflow; streamline,pathlineand streakline;continuityequation,irrotational androtationalflow,velocity potentialandstreamfunction, vortex flow,free and forcedvortex,sinkandsourceflow.

ModuleIII:DynamicsofFluidFlow

Euler'sequationofmotionanditsintegrationtoyieldBernoulli'sequation,itspracticalapplications–Pilot tube,Venturimeter; steadyflow momentumequation,forceexertedonapipe bend.Measurementof flowusing Venturimeter,orificemeter,Pitottube.measurementofflowinopen channels– rectangular,triangular

ModuleIV:DimensionalAnalysisandPrinciplesofSimilarity

Buckingham-Theoremanditsapplications.Geometric, KinematicsandDynamicsimilarity;Dimensionless numbers-Reynolds,Froude,Euler,Mach,WeberNumberandtheirsignificance.

ModuleV: LaminarandTurbulentFlow

Reynold'sexperiment,criticalvelocity,steadylaminarflowthroughacirculartube,flowbetweenparallel plates.Transition fromlaminartoturbulent flow,coursesofturbulence, velocitydistributionlawnearasolid boundary,velocitydistributioninroughpipes,Hazen–Williams'sformula.Boundarylayertheory.

Module VI: Introduction to computational fluids dynamics

Computational fluid dynamics : WHAT , WHEN AND WHY?, CFD application : Numerical vs experimental Vs Analytical mathematical classification of partial differential equation .

Evaluation:

Components	Internal Assessment	Attendance	MTE	ESE
Weightage(%)	30	5	15	50

Text &References:

Text:

- R.K.Bansal,"FluidMechanics&HydraulicMachines",LaxmiPublications(P)Ltd.,2002.
- Gupta,S.C.,FluidMechanicsandHydraulicMachines,PearsonEducation,2007
- D.S.Kumar,"FluidMechanicsandFluidPowerEngineering",S.K.Kataria&Sons,2000.

References:

- F.M. White,IntroductiontoFluidMechanics,McGrawHill
- I.H.Shames,"MechanicsofFluids",TataMcGrawHill
- Douglas,J. F.,Gasiorek,J.M.andSwaffield,J.,FluidMechanics,PearsonEducation,4/e,2006
- V.L.Streeterand E.B.Wylie,"FluidMechanics",TataMcGrawHill
- MasseyBS,MechanicsofFluids,VanNostrandReinholdCo

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AMITY SCHOOL OF ENGINEERING & TECHNOLOGY

Department of Electronics &Communication Engineering (ECE)/Electrical & Electronics Engineering (EEE)

Subject: BOS Meeting, 30th November 2021

The agenda items were taken up and after considerable deliberations amongst the BOS members, the following decisions were taken:

Changes in module of following subjects:

Course Code	Course Title
BEC 302	Analog Electronics –I
BEC 403	Communication Systems
BEC 503	Digital Communications
BEC 601	VLSI Design
BEC 701	Radar & Satellite Communications
BEC 801	Antenna & Wave Propagation
BEC 802	Embedded System Design and Device Driver Development
BEE 304	Electrical Machine-I
BEE 702	High voltage engineering
BEE 703	Power System protection

The meeting ends with thanks to all the members of the BOS.

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ATTENDANCE SHEET FOR BOS MEETING

Dated: 30th November 2021

S.No.	Name	Designation	Details	Signature
1	Prof.(Dr.)Pankaj Kumar Pandey	Professor	Chairperson	
2	Dr. Pramod Kumar Bhatt	Associate Professor	Member	
3	Dr. Sanjay Kumar Singh	Associate Professor	Member	
4	Dr. Puspendra Singh	Associate Professor, Department of EEE JKLU, Jaipur	Member	Online
5.	Mr. Arvind Kaul	CEO & Director of Enertrak Instruments Pvt. Ltd, Sitapura, Jaipur	Member	Online

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