Effective from the session 2019-20

BEM-C302
ENGINEERING MATHEMATICS – III

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credits 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Laplace Transform: Laplace transform of elementary functions, shifting theorems, transform of derivatives, Differentiation and Integration of transforms, Heaviside unit step and Dirac Delta functions, Convolution theorem, Solution of ordinary linear differential equations used in Mechanics, Electric circuits and bending of beams.

UNIT II

Fourier Transform: Definition of Fourier transform, Fourier sine and cosine transforms. Fourier integral formula, Parseval's identity, Applications of Fourier transform in solving heat equations.

UNIT III

Z transform: Definition, Linearity property, Z transform of elementary functions, Shifting theorems, Initial and final value theorem, Convolution theorem, Inversion of Z transforms, Solution of difference equations by Z transforms.

UNIT IV

Functions of Complex Variable: Limit and Continuity of functions of Complex Variables: Analytic Functions, Harmonic Conjugate, Cauchy-Riemann Equations (without proof), Line Integral, Cauchy Goursat theorem (without proof), Cauchy Integral formula (without proof), Singular Points, Poles & Residues, Residue Theorem, Application of Residues theorem for Evaluation of Real Integral (Unit Circle).

UNIT V

Errors and Roots of Equations: Absolute, relative, round-off and truncation errors. Significant digits. Algebraic and Transcendental Equations, Numerical solution, Method of bisection, Newton-Raphson method, Direct iterative method, convergence.

Text Books / References

1. Kreyszig E., Advanced Engineering Mathematics, John Wiley, New York, 1999
2. Gerald, C.F., Wheatley P.O., Applied Numerical Analysis, Pearson, 2007.
3. Grewal B.S., Higher Engineering Mathematics, Khanna, New Delhi, 2000.
4. Jain R. K., Iyenger S.R.K., Advanced Engineering Mathematics, Narosa , 2002.
5. Jain R. K., Iyenger S.R.K., Jain M.K., Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 2012.

Effective from the session 2020-2021

BME-C306
MATERIAL ENGINEERING

MM: 100 **Sessional: 30**
Time: 3 Hr. **ESE: 70**
L T P **Credit : 3**
3 0 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT-I

Crystal Structure: Crystal structure determination technique, Miller Indices, Diffusion, Unit cells, Metallic crystal structures, Ceramics. Imperfection in solids: Point, line, interfacial and volume defects; dislocation strengthening mechanisms and slip systems. **8**

UNIT-II

Mechanical Property measurement: Tensile, compression and torsion tests; Young's modulus, relations between true and engineering stress-strain curves, generalized Hooke's law, yielding and yield strength, ductility, resilience, toughness and elastic recovery; Hardness: Rockwell, Brinell and Vickers and their relation to strength. **8**

UNIT-III

Static failure theories: Ductile and brittle failure mechanisms, Tresca, Von-mises, Maximum normal stress, Fick law, Fatigue failure: High cycle fatigue, Stress-life approach, SN curve, endurance and fatigue limits, effects of mean stress using the Modified Goodman diagram; Fracture with fatigue, Introduction to non-destructive testing (NDT). **8**

UNIT-IV

Alloys, substitutional and interstitial solid solutions- Phase diagrams: Interpretation of binary phase diagrams and microstructure development; eutectic, peritectic, peritectoid andmonotectic reactions. Iron Iron-carbide phase diagram and microstrctural aspects of ledeburite, austenite, ferrite and cementite, cast iron. **8**

UNIT-V

Heat treatment of Steel: Annealing, tempering, normalising and spheroid sing, isothermal transformation diagrams for Fe-C alloys and microstructure development. Continuous cooling curves and interpretation of final microstructures and properties- austempering, martempering, case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, vacuum and plasma hardening. **8**

Suggested book:

S. No.	Name of Authors /Books /Publisher	Year of Publication
1.	Higdon, A., Ohlsen, E.H., Stiles, W.B., Weese, J.A., and Riley, W.F., "Mechanics of Materials", John Wiley & Sons, ISBN: 978-0-470-50873-2.	1989
2.	Timoshenko, S.P., and Gere, J.M., "Mechanics of Materials", 2nd Ed., CBS Publishers, ISBN: 9788123908946.	2002
3.	W. D. Callister, "Materials Science and Engineering-An Introduction", 6th Edition, Wiley India, **ISBN-10:** 0471736961	2006
4.	Hearn, E.J., "Mechanics of Materials", 3rd Ed., Pergamon, **SBN:** 9780750632669.	2003

Effective from the session 2020-2021

BME-C307
APPLIED THERMODYNAMICS

MM: 100 **Sessional: 30**
Time: 3 Hr. **ESE: 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction to solid, liquid and gaseous fuels– Stoichiometry, exhaust gas analysis- First law analysis of combustion reactions- Heat calculations using enthalpy tables- Adiabatic flame temperature- Chemical equilibrium and equilibrium composition calculations using free energy. 8

UNIT II

Vapor power cycles Rankine cycle with superheat, reheat and regeneration, exergy analysis. Super-critical and ultra-super-critical Rankine cycle- Gas power cycles. 4

Air standard Otto, Diesel and Dual Cycles-Air standard Brayton cycle, effect of reheat, regeneration and intercooling- Combined gas and vapor power cycles. 4

UNIT III

Basics of compressible flow. Stagnation properties, Isentropic flow of a perfect gas through a nozzle, choked flow, subsonic and supersonic flows- normal shocks- use of ideal gas tables for isentropic flow and normal shock flow- Flow of steam and refrigerant through nozzle, super saturation- compressible flow in diffusers, efficiency of nozzle and diffuser. 8

UNIT IV

Steam turbines, velocity and pressure compounding of steam turbines, Governing of turbines. Velocity diagram of simple & compound multistage impulse & reaction turbines & related calculations work done efficiencies of reaction, impulse Reaction Turbines, state point locus, Reheat factor. 8

UNIT V

Reciprocating compressors, staging of reciprocating compressors, optimal stage pressure ratio, effect of intercooling, minimum work for multistage reciprocating compressors. 8

Suggested books:

S. No.	Name of Authors /Books /Publisher	Year of Publication
1.	Moran, M.J., and Shapiro, H.M., "Fundamentals of Engineering Thermodynamics", 4th Ed., John Wiley & Sons, ISBN-10: 0470495901	2000
2.	Wark, K. Jr., and Donald, E.R., "Thermodynamics", 6th Ed., McGraw-Hill, ISBN 0-07-240296-2	1999
3.	Arora, C.P., "Refrigeration and Air Conditioning", 2nd Ed., TataMcGraw-Hill, ISBN-10: 9780070083905	2002

4.	Gordon, R., and Mayhew, Y., "Engineering Thermodynamics and Heat Transfer", 4th Ed., Addison-Wesley, SBN-10: 8131702065	2001
5.	Cengel, Y.A. and Boles, M.A., "Thermodynamics: An Engineering Approach", 3rd Ed., Tata McGraw-Hill, ISBN: 9780070262171.	2002

Effective from the session 2020-2021

BME-C308
ENGINEERING MECHANICS

MM: 100 **Sessional: 30**
Time: 3 Hr. **ESE: 70**
L T P **Credit : 3**
3 0 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT-I

Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in pace – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy. 8

UNIT-II

Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack. 6

UNIT-III

Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines. 8

UNIT-IV

Centroid of simple figures from first principle. centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook.9

UNIT-V

Introduction to Kinetics of Rigid Bodies, Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation;

9

Suggested books:

S. No.	Name of Authors /Books /Publisher	Year of Publication
1.	Irving H. Shames, Engineering Mechanics, 4th Edition, Prentice Hall, ISBN: 0133569241	2006
2.	P. Beer and E. R. Johnston, Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill, ISBN: 9781260085006	2011

3.	Bansal R.K., A Text Book of Engineering Mechanics, Laxmi Publications, ISBN-10: 8131804097.	2010
4.	Khurmi R.S., Engineering Mechanics, S. Chand & Co., ISBN-10: 8121931002.	2010
5.	Tayal A.K., Engineering Mechanics, Umesh Publications,5SBN 9789380117386.	2010

Effective from the session 2020-2021

BEE-C306
ELECTRICAL MACHINES

MM: 100 **Sessional: 30**
Time: 3 Hr. **ESE: 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Transformer: Construction, types and principle of operation, polarity test, Sumpner's test, all day efficiency.

Autotransformer: Volt- amp relation, efficiency, advantages & disadvantages and applications; Three- phase transformers: Connections, three- phase bank of single phase transformers, Scott connections; Instrument Transformers. 8

UNIT II

D.C. Machines: Construction, emf and torque equations. Armature reaction, commutation, performance characteristics of motors and generators, starting of motors, speed control losses and efficiency. 8

UNIT III

Three-Phase Induction Motor: Construction, rotating magnetic field and principle of operation,of equivalent circuit, torque production, Torque- slip characteristics, speed control, starting of squirrel cage and slip ring induction motors. 7

UNIT IV

Three-phase Synchronous Machines:

Alternator: Construction, emf equation & effects of pitch and distribution factors phasor diagram, armature reaction, Voltage regulation and its determination by synchronous impedance method, methods of synchronization.

SynchronousMotor: Principle of operation and starting torque and mechanical power developed, effect of excitation on line current, v-curves. 9

UNIT V

Fractional H.P. Motors: Single phase induction motor: Construction, revolving field theory and principle of operation, equivalent circuit and starting methods, no load and blocked rotor test. Universal motor, repulsion motor, stepper motor, and their applications.

Industrial Applications: Concept of braking in dc and ac motors, two quadrants and four quadrant operation of dc and three phase induction motors, industrial applications of dc and ac motors. 8

Suggested books:

S. No.	Name of Authors /Books /Publisher	Year of Publication
1.	Electric Machines by I J Nagrath& D P Kothari, Tata McGraw Hill,ISBN-9780074517895.	1997
2.	electric Machines by Ashfaq Husain, Dhanpat Rai & Com., ISBN-10: 8177001663.	2005

3.	Generalised Theory of Electrical Machines by Dr. P S Bimbhra , ISBN: 978-81-7409-225-0.	1996
4.	Irvin L.Kosow, Electric Machinery and Transformers Prentice Hall of India, ISBN-0132487330.	1990

Effective from the session 2020-2021

BME-C356
MATERIALS ENGINEERING LAB

MM: 50 **Sessional: 15**
Time: 2 Hr. **ESE: 35**
L T P **Credit: 1**
0 0 2

LIST OF EXPERIMENTS

1. Specimen preparation for micro structural examination-cutting, grinding, polishing, etching.
2. Grain Size determination of a given specimen.
3. Comparative study of microstructures of different given specimens (mild steel, gray C.I., brass, cooper etc.)
4. Heat treatment experiments such as annealing, normalizing, quenching, case hardening andcomparison of hardness before and after.
5. Material identification of say 50 common items kept in a box.
6. Faradays law of electrolysis experiment.
7. Study of corrosion and its effects.
8. Study of microstructure of welded component and HAZ. Macro & Micro examination.
9. Other tests such as shear, bend tests on UTM.
10. Hardness testing of given specimen using Rockwell and Vickers/Brinell testing machines.
11. Spring index testing on spring testing machine.
12. Fatigue testing on fatigue testing machine.
13. Torsion testing of a rod on torsion testing machine.
14. Study of non-destructive testing methods like magnetic flaw detector, ultrasonic flaw detector,eddy current testing machine, dye penetrant tests.
15. To conduct the Impact test (Izod / charpy) on the Impact testing machine and to find the impact strength.

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.

Effective from the session 2020-2021

BME-C357
APPLIED THERMODYNAMICS LAB

MM: 50 **Sessional: 15**
Time: 2 Hr. **ESE: 35**
L T P **Credit: 1**
0 0 2

LIST OF EXPERIMENTS

Minimum 10 experiments out of following:

1. Study of Fire Tube boiler model.
2. Study of Water Tube boiler model.
3. Study and working of Two stroke petrol Engine
4. Study and working of Four stroke petrol Engine
5. Study and working of Two stroke Diesel Engine
6. Study and working of Four stroke Diesel Engine.
7. Study of Impulse & Reaction turbine
8. Study of Steam Engine model.
9. Study of Gas Turbine model.
10. Study of Refrigeration model.
11. To conduct the tensile test on a UTM and determine ultimate tensile strength, percentage elongation for a steel specimen.
12. To conduct the compression test and determine the ultimate compressive strength for a specimen.
13. To determine the hardness of the given specimen using Brinell / Rockwell / Vicker testing machine.

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.

Effective from the session 2020-2021

BME-C358
ENGINEERING MECHANICS LAB

MM: 50 **Sessional:15**

Time: 2 Hr. **ESE: 35**
L T P **Credit: 1**
0 0 2

LIST OF EXPERIMENTS

1. To determine the efficiency of a machines
2. To determine the mechanical advantage and efficiency of screw jack
3. To measure coefficient of friction of different surfaces
4. To study the forces acting on trusses
5. To study the moment of inertia of a flywheel
6. To study Lami's theorem using universal force table apparatus
7. To study the equilibrium of parallel forces – simply supported beam reactions
8. To determine the velocity ratio, mechanical advantage and efficiency of worm and worm wheel.
9. To verify the parallelogram law of forces.
10. To verify the moment area theorem for slope anddeflection of beam.
11. To study and verify the behavior of strutswith various end conditions.
12. To study the performance of differential axle and wheel and find itsvelocity ratio, efficiency and law of machine.
13. To study of forces in the members of jib crane.

Note:

1. Each student shall be required to perform one experiment in the practical examination.
2. A Teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Every student shall have to perform minimum eight experiments during the semester.
6. Any Experiment based on syllabus may be added by permission of Head / Dean.

Effective from the session 2020-2021

BEE-C356
ELECTRICAL MACHINES LAB

MM: 50 **Sessional: 15**
Time: 2 Hr. **ESE: 35**
L T P **Credit: 1**
0 0 2

LIST OF EXPERIMENTS

1. To perform polarity test on single-phase transformer.
2. To perform open circuit test on single phase transformer & find its equivalent circuit parameters.
3. To perform short circuit test on single phase transformer & find its equivalent circuit.
4. To study Scott connection on single phase transformer.
5. To obtain magnetization characteristics of DC shunt generator.
6. To obtain load characteristics of DC shunt motor.
7. Speed control of DC shunt motor by armature control and field control.
8. To perform No load and block rotor lest on three phase induction motor & determine equivalent circuit
9. To study speed control of three phase induction motor by varying supply voltage.
10. To determine V-curve and inverted V-curve of three phase synchronous machine.
11. To perform No load and block rotor test on single phase induction motor.

NOTE
1. Each student shall be required to perform one experiment in the practical examination.
2. A Teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Every student shall have to perform minimum ten experiments during the semester.
6. Any Experiment based on syllabus may be added by permission of Head / Dean