Millia Institute of Technology
Rambagh, Purnea

Affiliated to BIhar Engineering University, Patna

NAAC Accredited & ISO 9001:2015

SYLLABUS

Department of Mechanical Engineering

2nd SEMESTER

B. Tech (Mechanical Engineering

SEMESTER –II

Sl No.	Course Code	Course Title	Hours Per Week			Total Credits
			Lecture	Tutorial	Practical	
1.	100201	Engineering Physics	3	0	0	3
2.	100202	Engineering Mathematics-II	3	1	0	4
3.	100203	Programming for Problem Solving	3	0	0	3
4.	100214P	Swachha Bharat Mission	0	0	2	1
5.	100206	Workshop Practices	2	0	0	2
6.	100204	Elements of Mechanical Engineering	3	0	0	3
7.	100201P	Engineering Physics Lab	0	0	2	1
8.	100203P	Programming for Problem Solving Lab	0	0	2	1
9.	100206P	Workshop Practices Lab	0	0	2	1
10.	100204P	Elements of Mechanical Engineering Lab	0	0	2	1
TOTAL						20

Group A 1st & 2nd Sem (SESSION 2024-2025)

Course Code-100201 Engineering Physics 3 0 0 3

Unit- 1.0

1. Frame of Reference: 2 hrs

Non-Inertial frame of reference, rotating coordinate system, centripetal and Coriolis acceleration and its application in weather system.

2. Oscillations: 3 hrs

Harmonic Oscillator, Damped Harmonic motion – overdamped, critically Damped and lightly damped oscillators, Force Oscillators and Resonance.

Unit- 2.0

1. Optics: 4 hrs

Huygens's Principle, Superposition of Waves and interference of Light by wave front-splitting and amplitude-splitting; Young's double slit experiment, Michelson interferometer, Fraunhofer diffraction from single slit and circular aperture, Diffraction Grating and their resolving power

2. LASER: 4 hrs

Einstein's theory of matter-radiations interaction, Einstein's Coefficients (A and B), Amplification by population inversion, Different types of lasers – Gas Laser, Helium-Neon Laser, Solid State Laser (Ruby, Neodymium), Semiconductor Laser.

Unit- 3.0

1. Quantum Mechanics: 5 hrs

Compton Effect, Photoelectric Effect, Wave Particle duality, de Broglie's hypothesis, Heisenberg's Uncertainty Principle, Wave function and wave packets, phase and group velocities, Schrodinger's Wave Equation, Normalization, Expectation values, Eigenvalues and Eigenfunction.

2. Applications in One dimensions: 2 hrs

Application of Schrodinger Wave Equation for particle in one dimensional box – its wavefunction and eigenvalue of energy and momentum.

Unit- 4.0

1. Vector Calculus: 2 hrs

Gradient, Divergence and Curl, Line, Surface and Volume integrals, Gauss's Divergence theorem and Stokes' theorem in Cartesian Coordinate.

2. Electrostatics: 4 hrs

Gauss's Law and its applications, Divergence and Curl of Electrostatic fields, Electrostatic Potential, Boundary Conditions, Poisson's and Laplace's equations, Dielectrics, Polarization, Bound Charges, Electric displacement, Boundary Conditions in dielectrics.

Unit- 5.0

1. Magnetostatics: 4 hrs

Lorentz force, Biot-Savart and Ampere's circuital laws and their applications, Divergence and Curl of Magneto static fields, Magnetic vector potential, Force and torque on a magnetic dipole, Magnetic Materials, Magnetization, Bound currents, Boundary conditions.

2. Electrodynamics and Electromagnetic Waves: 4 hrs

Ohm's law, Motional EMF, Faraday's Law, Lenz's law, Self and mutual inductance, Energy stored in magnetic field, Maxwell's equations in vacuum and nonconducting medium, Continuity Equation, Poynting Theorem, Wave Equations: plain electromagnetic wave in vacuum and their transverse nature and Polarization.

Unit- 6.0

1. Introduction to Solids and Semi-Conductors: 3 hrs

Free electron theory of metal, fermi level, Bloch's theorem for particle in a periodic Potential, Kroning-Penney model and origin of energy band.

2. Electronic Materials: 3 hrs

Metals, semiconductors and insulators, intrinsic and extrinsic semiconductors,Carrier transport, diffusion and drift, P-N junction.

Group A 1st & 2nd Sem (SESSION 2024-2025)

Test/ Reference:-

1. Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles, R. Eisberg R. Resnick, Wiley India Pvt. Ltd ISBN 978-81-265-0818-1
2. Theory of Vibration with Application, W.T. Thomson M. D. Dahleh, Pearson India ISBN 978-81-317-0482-0
3. Introduction to Electrodynamics, D.J. Griffiths, Pearson India, ISBN 978-93-325-5044-5
4. Electromagnetism, I.S. Grant, W. R. Phillips, Wiley India Pvt. Ltd ISBN 978-04-719-2712-9
5. The Feynman Lectures on Physics, R.P. Feynman R. B. Leighton, Pearson India ISBN 978-00-710-7458-2
6. Optics, Ajay Ghatak ,McGraw Hill ISBN 978-93-901-1359-0
7. Physics of Vibration and Waves, H. J. Pain, Wiley India Pvt. Ltd, ISBN 978-04-700-1296-3
8. Concept of Modern Physics, Arthur Beiser, McGraw Hill ISBN 978-93-513-4185-7
9. Introduction to Solid State Physics, C. Kittle , Wiley India Pvt. Ltd, ISBN 978-81-265-7843-6

Group A 1st & 2nd Sem (SESSION 2024-2025)

Course Code-100201P Engineering Physics Lab 0 0 2 1

Perform any 10 Experiments

1. Determination of the capacitance and permittivity of the given material.
2. Determination of e/m of electron.
3. Determination of Planck's constant and Photoelectric Work Function using Photoelectric cell.
4. Verification of inverse square law using photocell.
5. Determination of Wavelength of (He-Ne) LASER using Diffraction Grating Method.
6. Calculation of Energy Band Gap of a semiconductor.
7. Determination of Dielectric constant using resonance method.
8. Determination of Wavelength of Sodium light by measuring the diameter of the Newton's Ring.
9. Determination of curvature of convex surface of a lens by Newton's ring.
10. Verification of existence of Bohr's Energy level with Frank-Hertz apparatus.
11. Determination of the Earth's horizontal magnetic field intensity and magnetic Moment of a magnet by employing magnetometer.
12. Verification of Faraday's Law and Lenz's Law of Electromagnetic Induction.

Group A 1st & 2nd Sem (SESSION 2024-2025)

Course Code-100202 Engineering Mathematics– II 3 1 0 4

Unit- 1.0 Complex Analysis – I 6 hrs

Functions of complex variable, limit, Continuity, Differentiability, Analytic function, Cauchy-Riemann Equations in Cartesian and polar form, harmonic function and harmonic conjugate.

Unit- 2.0 Complex Analysis – II 8 hrs

Line Integral, contour integrals, Cauchy theorem, Cauchy's Integral formula(without proof), Taylors series, zero of analytic functions, singularities, Laurent's series, residue, Cauchy residue theorem(without Proof) and its applications.

Unit- 3.0 Ordinary Differential Equations 8 hrs

Linear differential equations of nth Order with constant coefficients, solution of Homogeneous and Non-Homogeneous Equations, Equations with variable coefficients, Cauchy- Euler Equations, Method of Variation of Parameters.

Unit- 4.0 Sequence and Series 6 hrs

Introduction of Sequence and Series, Nature of series Tests of convergence of Series: Comparison test, D'Alembert ratio test, Cauchy's Root test, Raabe's test, Logarithmic test, Cauchy's condensation test.

Unit- 5.0 Laplace Transform 8 hrs

Laplace Transform, Existence theorem, properties of Laplace Transform, Laplace Transform of Periodic functions, Inverse Laplace Transform, convolution theorem. Application of Laplace Transform to solve Ordinary differential equations.

Unit- 6.0 Fourier Series 6 hrs

Fourier Series, Fourier Series for odd and even functions, Half range sine and cosine series, Parseval's theorem.

Test/ Reference:-

1. Advanced Engineering Mathematics, Kreyszig Erwin, John Wiley and Sons,10th Edition,2020 ISBN:978-0470-45836-5
2. Advanced Engineering Mathematics, Dass H.K., S Chand and Company pvt.Ltd.,22nd Edition,2018 ISBN:978-93-5283-718-2
3. Higher Engineering Mathematics, Grewal B.S., Khanna Publishers,44th Edition,2023 ISBN:9788174091154
4. Complex Variables (Theory and Applications), Kasana H.S., PHI,2nd Edition.2015 ISBN:978-81-203-2641-5
5. A Text Book of Engineering Mathematics, Bali N.P., Goyal Manish Laxmi Publications,9th Edition,2014
6. Higher Engineering Mathematics, Ramana B.V., Tata McGraw Hill New Delhi, 11th Reprint, 2010, ISBN-10 007063419X ISBN-13978- 0070634190
7. Differential Equations, Ross S.L.,Wiley Publications,3rd edition,2016 ISBN:978-81-265—1537-0
8. Advanced Differential Equations, Raisinghania M.D., S.Chand and Company PVT.LTD.,18th Edition,2015 ISBN:978-81-219-0893-1
9. Schaum's Outlines Complex Variables, Spiegel Murray R, Lipschutz Seymour, Schiller J John and Spellman Dennis, MC Graw Hill Education Private Ltd.2nd Edition,2010 ISBN:978-0-07-008538-1

Group A 1st & 2nd Sem (SESSION 2024-2025)

Course Code-100203 Programming for Problem Solving 3 0 0 3

Unit- 1.0

Introduction to Programming **6 hrs**

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.). Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/ Pseudo code with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

Unit- 2.0

Operators, Conditional Branching and Loops **8 hrs**

Arithmetic expressions/arithmetic operators, relational operators, logical operators, bitwise operators and precedence. Writing and evaluation of conditionals and consequent branching, Iteration and loops.

Unit- 3.0

Arrays and String **6 hrs**

Array declaration & initialization, bound checking arrays (1-d, 2-d), character arrays and strings.

Unit- 4.0

Function, Recursion and Pointers **9 hrs**

Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Idea of pointers, Defining pointers, Use of Pointers in self- referential structures, idea of call by reference.

Unit- 5.0

User defined Data Types and File handling **8 hrs**

Structure- defining, declaring, initializing; accessing structure members, processing of structure, array of structures, structures within structure, structure and function, type definition; Union— definition, declaration, accessing union members, initializing union. Introduction, file declaration, opening and closing a file, working with text and binary files, I/O operations on file, error handling, random access to files

Unit- 6.0

Basic Algorithms **5 hrs**

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

Test/ Reference:-

1. Programming in ANSI C 4th Ed,E Balagurusamy, McGraw Hill Education India Private Limited, ISBN-978-9339219666, 7th Edition
2. The C Programming Language 2e,W. Kernighan / Dennis Ritchie,Pearson Education India, 978-9332549449, 2nd Edition
3. Computer Fundamentals and Programming in C,ReemaThareja,Oxford University Press, ISBN- 978-9354977893, 3rd Edition

Group A 1st & 2nd Sem (SESSION 2024-2025)

Course Code-100203P Programming for Problem Solving Lab 0 0 2 1

Perform any 10 Experiments

1. Tutorial 1: Problem solving using computers:
   Lab1: Familiarization with programming environment
2. Tutorial 2: Variable types and type conversions:
   Lab 2: Simple computational problems using arithmetic expressions
3. Tutorial 3: Branching and logical expressions:
   Lab 3: Problems involving if-then-else structures
4. Tutorial 4: Loops, while and for loops:
   Lab 4: Iterative problems e.g., sum of series
5. Tutorial 5: 1D Arrays: searching, sorting:
   Lab 5: 1D Array manipulation
6. Tutorial 6: 2D arrays and Strings
   Lab 6: Matrix problems, String operations
7. Tutorial 7: Functions, call by value:
   Lab 7: Simple functions
8. Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration):
   Lab 8 and 9: Programming for solving Numerical methods problems
9. Tutorial 10: Recursion, structure of recursive calls
   Lab 10: Recursive functions
10. Tutorial 11: Pointers, structures and dynamic memory allocation
    Lab 11: Pointers and structures
11. Tutorial 12: File handling:
    Lab 12: File operations

Group A 1st & 2nd Sem (SESSION 2024-2025)

Course Code-100214P Swatch Bharat Mission 0 02 1

Objectives:
1. Understanding the importance of cleanliness and sanitation: The course could aim to create
awareness about the significance of cleanliness and sanitation in maintaining personal health,
environmental sustainability, and community well-being. It could cover topics such as waste management, sanitation practices, and the impact of poor sanitation on public health.
2. Developing skills for effective waste management: The course could provide training on various waste management techniques, such as waste segregation, composting, recycling, and proper disposal of hazardous waste. It could also emphasize the importance of reducing waste generation and promoting sustainable waste management practices.
3. Promoting behavioural change towards cleanliness: The course could focus on influencing
positive behavioural change among individuals and communities towards cleanliness. It could include modules on promoting good hygiene practices, creating awareness about the harmful effects of littering and open defecation, and encouraging responsible waste disposal habits.
4. Creating awareness about Swachh Bharat Mission initiatives: The course could provide information about the Swachh Bharat Mission initiatives and campaigns launched by the Government of India to promote cleanliness and sanitation, such as Swachh Survekshan, Swachh Bharat Abhiyan, and Clean India Campaign. It could also discuss the progress made,
challenges faced, and future prospects of the Swachh Bharat Mission.
5. Engaging in community participation and advocacy: The course could emphasize the importance of community participation in the Swachh Bharat Mission and provide tools and strategies for engaging with local communities to promote cleanliness and sanitation. It could
also encourage advocacy for policy changes and innovations to address sanitation-related issues at the community, regional, and national levels.
6. Pre-requisite: Nil
7. Course Outcome:
8. Increased awareness and knowledge about cleanliness and sanitation: Participants of the course may gain a deeper understanding of the importance of cleanliness and sanitation, including the impact on personal health, environmental sustainability, and community well-being. They may learn about various waste management techniques, hygiene practices, and the initiatives of the Swachh Bharat Mission.
9. Enhanced skills for effective waste management: Participants may acquire practical skills related to waste management, such as waste segregation, composting, recycling, and proper disposal of hazardous waste. They may also develop skills in reducing waste generation and promoting sustainable waste management practices in their communities or workplaces.
10. Positive behavioral change towards cleanliness: The course may influence participants to
adopt positive behavioral changes towards cleanliness, such as avoiding littering, practicing good hygiene habits, and promoting responsible waste disposal. Participants may develop a sense of responsibility towards maintaining cleanliness in their surroundings and actively contribute towards creating a cleaner environment.
11. Increased community participation and advocacy: Participants may become actively engaged in community participation and advocacy efforts related to cleanliness and

sanitation. They may collaborate with local communities, government bodies, and non-governmental organizations (NGOs) to raise awareness, implement cleanliness initiatives, and advocate for policy changes or innovations to address sanitation-related issues.

12. Contribution towards Swachh Bharat Mission objectives: Participants may contribute towards the objectives of the Swachh Bharat Mission, such as promoting cleanliness, ensuring proper waste management, and eliminating open defecation. They may actively participate in Swachh Bharat Mission campaigns, initiatives, and activities, and make a positive impact on their communities and society at large.
13. List of Reports:
14. Any topics related to Swatch Bharat Mission

Group A 1st & 2nd Sem (SESSION 2024-2025)

Course Code-100206 Workshop Practices 2 0 0 2

Unit-1

Sheet Metal Working: 6 hrs

Sheet material: GI sheets, aluminium, tin plate, copper, brass etc; Tools: steel rule, vernier callipers, micrometer, sheet metal gauge, scriber, divider, punches, chisels, hammers, snips, pliers, stakes etc.; operations: scribing, bending, shearing, punching etc; Product development: hexagonal box with cap, funnel etc.

Unit-2

Joining: 6 hrs

Classifications of joining processes; Brazing, Soldering, and Mechanical Joints, Arc welding, Gas welding etc.

Unit-3

Pattern Making and Foundry Practice: 6 hrs

Pattern material: wood, cast iron, brass, aluminium, waxes etc.; Types of patterns: split, single piece, match plate etc; Tools: cope, drag, core, core prints, shovel, riddle, rammer, trowel, slick, lifter, sprue pin, bellow, mallet, vent rod, furnace etc. Moulding sands: green sand, dry sand, loam sand, facing sand etc., Sand casting: Sand preparation, mould making, melting, pouring, and cleaning

Unit-4

Fitting Shop 10 hrs

Introduction to Fitting; Fitting Tools: Files and their classification, Holding Tools, Cutting Tools, Measuring and Marking Tools, Thread Making Tools, Various Fitting Power Tools; Methods Of Filing: Cross Filling and Draw Filing, Other associated operations Marking. Sawing and Chipping; Safety and Precautions in Fitting Shop.

Unit-5

Carpentry Shop 7 hrs

Introduction to Carpentry Shop; Types of Wood; Seasoning of Wood: Ty[es of Seasoning Methods; Defects in wood; Structure of Wood; Car[entry Tools; Measuring Tools, Marking Tools, Cutting Tools, Planning Tools, Drilling and Boring Tools, Holding Tools, Striking Tools, Auxiliary tools and materials used in Carpentry; Wood working Processes; Carpentry joints; wood Working Machines: Wood Working Lathe, Circular Saw, Thickness Planer, Band sawSafety and precautions in Carpentry Shop.

Unit-6

Smithy Shop 5 hrs

Introduction to Smithy Sho; Forging Tools and Equipment; Forging Operations: Drawing, Upsetting, Swaging, Punching, Drifting, Fullering, Bending; Hot Working Processes: Rolling, Drop Forging, Press Forging, Hot Extrusion, Hot Drawing, Cold Working Process, Safety and Precautions in Smithy Shop.

Test/ Reference:-

1. Hajra Choudhury S.K., Hajra Choudhury A.K. And Nirjhar Roy S.K., "ElementsOf Workshop Technology", Vol. I 2008 And Vol. Ii 2010, Media PromotersAnd Publishers Private Limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering AndTechnology", 4th Edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan And A. Suresh Babu,"Manufacturing Technology – I"Pearson Education, 2008.
4. Roy A. Lindberg, "Processes And Materials Of Manufacture", 4th Edition,Prentice Hall India, 1998.
5. Rao P.N., "Manufacturing Technology", Vol. I And Vol. Ii, Tata McgrawhillHouse, 2017.

Group A 1st & 2nd Sem (SESSION 2024-2025)

Course Code-100206P Workshop Practices Lab 0 0 2 1

Perform all Experiments

List of Practical:

1. Learn and apply of different fitting tools –like work holding, marking, measuring, cutting, finishing and miscellaneous. Student will also prepare the report with sketch, specifications and applications of fitting tools demonstrated.
2. Prepare one simple and another male-female type fitting jobs as per given drawings- 2 jobs
3. Learn and apply of different tin smithy tools. Student will also prepare the report with sketch, specifications and applications of tin smithy tools demonstrated.
4. Learn and apply of welding equipments and making minimum one model.
5. Learn and apply of foundry tools and making minimum one model.
6. Learn and apply of carpentry tools and making minimum one model.
7. Learn and apply of Sheet Metal tools and making minimum one model.
8. Learn and apply of Lathe Tools & operations for making a job.
9. Learn and apply the application of measuring tools.
10. Learn and apply any casting process for making a model

Group A 1st & 2nd Sem (SESSION 2024-2025)

Course Code-100204 Elements of Mechanical Engineering 3 0 0 3

Unit- 1.0 **6hrs**

Energy Resources:

Renewable or non-conventional sources of energy, their origin and various forms-solar, wind. Biogas and biomass energy, their merits & demerits, major applications-brief description Non-renewable or non-renewable or conventional sources of energy: the fossil fuel. Coal, petroleum and natural gas.

Unit- 2.0 **4hrs**

Review of Basic Concepts Of Thermodynamics:

Thermodynamics system, properties, state, processes and cycles. Heat, work and internal energy.

Unit- 3.0 **4hrs**

Steam Generators:

Types of boilers, water-tube and fire-tube boilers-their merits and demerits, boiler mountings and accessories-simple description.

Unit- 4.0 **8hrs**

Basic Concept of Refrigeration And Air Conditioning:

Principles of working or vapour compression, vapour absorption and air refrigeration; principles of air conditioning systems.

Unit- 5.0 **10hrs**

Prime Movers:

Simple steam turbine, gas-turbine, IC engines (SI and CI), their brief description and principles of working.

Power Plant:

principles of working of thermal, hydel and nuclear power plants, work output and efficiency.

Unit- 6.0 **6hrs**

Engineering Materials and Their Properties:

Ferrous and non-ferrous metals: Mechanical properties e.g. strength, hardness, resilience etc.

Heat Treatment of Steel:

Annealing, tempering, quenching, case-hardening etc.

Test/ Reference:-

1. Basic Mechanical Engineering, By T J Prabhu,
2. Element of Mechanical engineering, J.K .Kitlur, G.D.Gokak
3. Basic Mechanical Engineering, By Sadhu singh,
4. Element of Mechanical engineering, S. N. Lal

Group A 1st & 2nd Sem (SESSION 2024-2025)

Course Code-100204P Elements of Mechanical Engineering Lab 0 0 2 1

Perform all Experiments

1. Demonstrate & study of steam boilers and its mounting & accessories.
2. Demonstrate & study the working of SI internal combustion Engines &its components.
3. To learn the mechanical properties of engineering materials.
4. To learn the working of steam power plant.
5. To learnt the working of vapour compression refrigeration system.
6. To learn the working of impulse steam turbines.
7. To study the working of gas turbines.
8. To learn the working of reaction steam turbines
9. To learnt the working of vapour absorption refrigeration system.
10. Demonstrate & study the working of CI internal combustion Engines &its components.