

SEMESTER III

Program: B.Tech
Semester: Three
Course: Mathematics III
Course Code: 8BSC201

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Course Learning Objective:

- **CLO 1:** To explain the principles of the Fourier and Laplace Transforms and to highlight the domains in which they are used, including PDE applications, digital signal processing, image processing, wave equation theory, differential equations, and many more.
- **CLO 2:** To learn boundary value issues that arise in scientific and engineering difficulties using the Fourier series.
- **CLO 3:** To learn principles of discrete probability to calculate probabilities and expectations of simple random processes.
- **CLO 4:** To learn some discrete structures (e.g., sets, relations, function, graphs) that provide the mathematical formalizations for computational problems.

Course Outcome:

On the completion of the Course, the students will be able to:

CO 1: Evaluate initial value problem and boundary value problem using Laplace Transform.

CO 2: Understand Fourier transform and its properties and will be able to solve the examples based on it. Have deep understanding to handle various types of problems using different kind of integral Transforms.

CO 3: Understand probabilities and discrete distributions for simple combinatorial processes; calculate expectations.

CO 4: Understand set operations, various types of relations and their representations, solving recurrence relations.

Course Content:

Topics	Hours
Unit 1: Laplace Transform	10
Laplace Transformation: Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace Transform method.	
Unit II: Fourier series and Transform	6
Fourier series and Transform: Fourier series, Dirichlet's conditions, Determination of Fourier coefficient, Fourier series defined in two or more sub range, half range Series. Fourier Transformation and inverse Fourier Transformation, sine, cosine Transformation, Inverse Transformations -simple illustration.	
Unit III: Sets, Relations and Functions	8
Sets, Relations and Functions Basic operations on sets, Cartesian products, disjoint union (sum), and power sets. Different types of relations, their compositions and inverses. Different types of functions, their compositions and inverses.	
Unit IV: Introduction to Counting Technique and graph	8
Introduction to Counting Technique and graph Basic counting techniques – inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relation and generating functions. Introduction to Graphs Graphs and their basic properties – degree, path, cycle, subgraph, isomorphism, Eulerian and Hamiltonian walk.	

Suggested Reading:

1. *Higher Engineering Mathematics*, B.S. Grewa
2. *N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.*
3. *P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).*
4. *S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.*
5. *J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and It's Application to Computer Science", TMG Edition, TataMcgraw-Hill*
6. *Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press. Schaum's Outlines Series, Seymour Lipschutz, Marc Lipson.*

Program: B.Tech
Semester: Three
Course: Engineering Mechanics
Course Code: 8ESC201

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Course Learning Objective:

CLO 1: Use scalar and vector analytical techniques for analysing forces in statically determinate structures

CLO 2: Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems

CLO 3: Apply basic knowledge of maths and physics to solve real-world problems

CLO 4: Understand basic kinematics concepts – displacement, velocity and acceleration (and their angular counterparts);

CLO 5: Understand basic dynamics concepts – force, momentum, work and energy;

CLO 6: Understand and be able to apply Newton's laws of motion.

Course Outcome:

On the completion of the Course, the students will be able to:

CO 1: To understand the basic concepts of force systems & its various force analysis.

CO 2: Understand the static equilibrium of particles and rigid bodies both in two dimensions and three dimensions.

CO 3: Analyze the properties of surfaces & solids in relation to moment of inertia.

CO 4: Illustrate the laws of motion, kinematics of motion and their interrelationship.

CO 5: Understand Kinetics of Rigid Bodies & Free and forced vibrations.

Course Content:

Topics	Hours
Unit I:	
Introduction to Engineering Mechanics - Force Systems: Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space –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:	
Friction: Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack; Centroid and Centre of Gravity -Centroid of Lines, Areas and Volumes from first principle, centroid of composite sections; Centre of Gravity and its implications. – Theorem of Pappus.	6
Unit III:	
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; Product of Inertia, Parallel Axis Theorem, Perpendicular Axis Theorem , Mass Moment of Inertia: Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia – Mass moment of inertia of composite bodies.	6
Unit IV:	
Review of particle dynamics- Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton’s 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique).	6
Unit V:	
Kinetics of Rigid Bodies -Basic terms, general principles in dynamics; Types of motion, Instantaneous center 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.	6

Suggested Reading:

1. *A Textbook of Engineering Mechanics By D S KUMAR*
2. *A Textbook of Engineering Mechanics By R S KHURMI*
3. *A Textbook of Engineering Mechanics By S.S. BHAVIKATTI*
4. *A Textbook of Engineering Mechanics By R.K.BANSAL*

Program: B.Tech
Semester: Three
Course: Introduction to Mining
Course Code: 8PCCMiE201

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Course Learning Objective:

- CLO 1:** Enable students to demonstrate the importance of mining in national economy.
- CLO 2:** Students will understand the terminology associated with the discipline and be familiar with the available regulatory mechanism to enable safe & sustainable mining operations.
- CLO 3:** Equips the students with detail knowledge on various engineering techniques used for drilling, blasting, roof support and allied activities in mine construction for exploitation of minerals.

Course Outcome:

On the completion of the Course, the students will be able to:

- CO 1:** Understand the history & significance of mining and mineral resources of India.
- CO 2:** Gain the basic concept of mining, its terminology and classification.
- CO 3:** Explain the technical knowledge of mode of access to deposit, type of mining & advantages & disadvantages.
- CO 4:** Understand the different mining methods, its applicability & limitation.

Course Content:

Topics	Hours
Unit 1: Significance of Mining Industry, History of Mining, Mining & Socio Economic impact. Mining and Surface Environment, Health and Safety. Mineral Resource of India, Mineral and energy resources of world, Terminology in Mining.	6
Unit II: Mining – definition and economic importance; mine – definition, different types and classification; Mine life cycle; Mineral deposit – different types and their classification.	8
Unit III: Modes of entry to a mine – shaft, incline, decline, adit and box-cut. Overview of surface mining: Types of surface mines, unit operations, basic bench geometry, applicability & limitations and advantages & disadvantages.	8
Unit IV: Overview of underground mining: Different coal mining methods and their applicability & limitations; Different metal mining methods and their applicability & limitations; Basic concepts of transportation, ventilation, illumination and support in underground mines.	10

Suggested Reading:

1. *Explosive and Blasting Techniques*, G.K. Pradhan
2. *Explosives and Blasting Techniques*, S.K. Das
3. *Elements of mining technology*, D.J. Deshmukh

Program: B.Tech
Semester: Three
Course: Mining Geology
Course Code: 8PCCMiE202

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Course Learning Objective:

CLO 1: This will provide basic knowledge on identification of various rocks & minerals by verifying the physical properties.

CLO 2: The course will equip the students with the ability to appreciate the structure of earth and ore formations.

CLO 3: The students will have knowledge about ore reserve estimation, ore assaying, remote sensing, geological mapping and identification of geological structures in the field.

CLO 4: To practice the determination of engineering properties of rocks, preparation of weathering profiles, RMR, RQD, preparation of geological and structural maps and congestion of geological structures in the field.

Course Outcome:

On the completion of the Course, the students will be able to:

CO 1: Enhance the technical knowledge on shape, size, mass & density of earth, age of earth, structure of the earth.

CO 2: Understand the concept of mineralogy with special light on sulphides, silicates and oxides minerals.

CO 3: Explain the process of petrology and formation of rock.

CO 4: Understand the concept of paleontology and stratigraphy & coal and oil belts of India.

Course Content:

Topics	Hours
Unit I:	
Physical Geology: Origin of Earth, Interior of Earth, Study of Earth surface and features-Mountains/valley/rivers/lakes/volcanoes, study and their formation. Types of rocks and their process of formation, types of minerals.	6
Unit II:	
Mineralogy: Minerals: Physical and chemical properties of crystal, Types of crystallization system, classification of minerals and properties of common silicate minerals (Quartz Feldspar pyroxene Amphibole Garnet Olivine, Mica), Sulphides (Pyrite, Chalcopyrite Galena Sphalerite) and oxides (Hematite, Magnetite, Chromites, Pyrolusite Psilomelane).	8
Unit III:	
Petrology: Igneous rocks, Magma and lava extrusive and intrusive forms classification and description of some common igneous rock (Granite Dolerite Gabbros' Basalt Rhyolite Pegmatite)Sedimentary rocks, Sedimentation processes, classification and description of common Sedimentary rocks (Conglomerate Sandstone Shale Limestone).Metamorphic rock Processes of metamorphism, texture and structure of metamorphic rock, classification and description of some common metamorphic rock (Slate Pyrite Schist Gneiss, Quartzite, Marble)	10
Unit IV:	
Paleontology and Stratigraphy: Concept of paleontology, Fossils their mode of preservation and significance as indices of age and climate, concept of index fossils, Principle of stratigraphy, Broad stratigraphy subdivision and associated rock types of important coal belts and oil fields of India.	8

Suggested Reading:

1. *A text book of Geology, P.K. Mukherjee*
2. *Structural Geology, S.W. Chiplonkar*

Program: B.Tech**Semester:** Three**Course:** Mining Geology Lab**Course Code:** 8PCCMiE202P

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List of Experiments:

1. To Study the geological maps
2. Mineralogy: Study of physical properties of Minerals.
3. Petrology: Study of common igneous rocks.
4. Petrology: Study of common sedimentary rocks.
5. Petrology: Study of common metamorphic rocks

Program: B.Tech
Semester: Three
Course: Mine Surveying I
Course Code: 8PCCMiE203

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Course Learning Objective:

CLO 1: The course provides for basic skills in survey and correct usage of survey instruments.

CLO 2: The student will be able to enter for the Elementary Survey Course.

CLO 3: Appreciate the need for accurate and thorough note taking in field work to serve as a legal record.

CLO 4: Gain the ability to use modern survey equipment to measure angles and distances.

CLO 5: Gain the ability to measure differences in elevation, draw and utilize contour plots, and calculate volumes for earthwork.

CLO 6: Improve ability to function as a member of a survey party in completing the assigned field work.

Course Outcome:

On the completion of the Course, the students will be able to:

CO 1: Enhance the technical knowledge on linear measurements by chain surveying & tape surveying, compass surveying and plane table surveying.

CO 2: Identify and evaluate the engineering problems in leveling and angular measurements with various surveying tools like theodolite, levels etc.

CO 3: Apply the use of Total Stations & EDM in field and concept of contour.

CO4: Understand the application of plan table survey and modern engineering tools necessary for mine surveying.

Course Content:

Topics	Hours
Unit I:	
Surveying: Definition, objective, classification and principles of surveying. Linear Measurement: Instruments for measuring distances; ranging and taping survey lines; Chain surveying-principle, field work, off-sets, booking and plotting, obstacles in taping.	10
Unit II:	
Angular Measurement: Bearing of lines; Rectangular coordinate system; Essentials of the micro-optic theodolite; Measurement of horizontal and vertical angles; Temporary and permanent adjustments; Theodolite traversing; Computation of co-ordinates; Adjustment of traverse; Temporary and permanent adjustments. Levelling: Definition terminology; Levelling instruments types- tilting, auto set and digital levels; Levelling staves; Different types of levelling-differential, profile, cross-sectional and reciprocal leveling; Booking and reduction methods; Underground leveling; Temporary and permanent adjustments of levels.	6
Unit III:	
Total Station: Principle of electronic measurement of distance and angles; construction and working with Total Station; Errors; Application and recent developments in Total Station. Contours: Concepts; Characteristics of contour; Contour Interval; Methods of contouring and uses of contours.	8
Unit IV:	
Plane Table Surveying: Details surveying and contouring using plane table and micro-optic alidade. Computation of area and volumes.	8

Suggested Reading:

1. *Surveying and leveling VOL I,II, T. P. Kanetkar*
2. *Surveying & Levelling , B.C. Punmia*

Program: B.Tech
Semester: Three
Course: Mine Surveying I Lab
Course Code: 8PCCMiE203P

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List of Experiments:

1. Locating various objects by chain & determination of area of polygon by Chain Surveying.
2. To find the bearings of various station points and to calculate the included angles in a closed traverse.
3. Study of different parts of a Transit Theodolite and its Temporary adjustments. Measurement of Horizontal angle by method of Repetition and Reiteration method.
4. Study of different Levels and Levelling staffs. Practice of Temporary adjustments and to find out the reduced levels of the given points using Dumpy Level by Height of Collimation method.
5. Calculation of R.L. for different points involving 2 instrument stations & reduction by Rise and fall method.
6. Study of plane table surveying equipment's and accessories. To solve two point and three point problem.

Program: B.Tech
Semester: Three
Course: Community Engagement and Social Responsibility
Course Code: 8UMC102

L	T	P	C
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Course Learning Objective:

CLO 1: To develop an appreciation of rural culture, life-style and wisdom amongst students.

CLO 2: To learn about the status of various agricultural and rural development programmes.

CLO 3: To understand causes for rural distress and poverty and explore solutions for the same.

CLO 4: To apply classroom knowledge of courses to field realities and thereby improve quality of learning.

Course Outcomes:

On the completion of the Course, the students will be able to:

CO 1: Gain an understanding of rural life, culture and social realities.

CO 2: Develop a sense of empathy and bonds of mutuality with local community.

CO 3: Appreciate significant contributions of local communities to Indian society and economy.

CO 4: Learn to value the local knowledge and wisdom of the community.

CO 5: Identify opportunities for contributing to community's socio-economic improvements.

Course Content:

Topics	Hours
Unit 1: Appreciation of Rural Society	8
Rural life style, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of “soul of India lies in villages’ (Gandhi), rural infrastructure.	
ASSIGNMENT: Prepare a map (physical, visual or digital) of the village you visited and write an essay about inter-family relations in that village.	
Unit II: Understanding rural economy & livelihood	8
Agriculture, farming, landownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets.	
ASSIGNMENT: Describe your analysis of rural household economy, its challenges and possible pathways to address them.	
Unit III: Rural Institutions	8
Traditional rural organisations, Self-help Groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civil society, local administration.	
ASSIGNMENT: How effectively are Panchayati raj institutions functioning in the village? What would you suggest to improve their effectiveness? Present a case study (written or audio- visual)	
Unit IV: Rural Development Programmes	8
History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swatchh Bharat, PM Awaas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA, etc.	
ASSIGNMENT: Describe the benefits received and challenges faced in the delivery of one of these programmes in the rural community; give suggestions about improving Implementation of the programme for the rural poor.	

Suggested Reading:

1. Singh, Katar, *Rural Development : Principles, Policies and Management*, Sage Publications, New Delhi, 2015.
2. *A Hand book on Village Panchayat Administration*, Rajiv Gandhi Chair for Panchayati Raj Studies, 2002.
3. *United Nations, Sustainable Development Goals, 2015 un.org/sdgs/*
4. *M.P.Boraian, Best Practices in Rural Development*, Shanlax Publishers, 2016.

Program: B.Tech
Semester: Three
Course: Effective Technical Communication
Course Code: 8HSMC201

L	T	P	C
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Course Learning Objective:

The objectives of the course are:

CLO 1: To teach students the principles of technical communication for their academic and professional needs, focusing on essential written and oral skills for presenting technical information effectively.

CLO 2: To make the students aware of the basic principles, which include the analysis of context, purpose and audience.

CLO 3: To enhance fundamentals of technical report writing.

CLO 4: To equip their effective technical presentations.

Course Outcome:

On the completion of the Course, the students will be able to:

CO 1: Be able to grasp the ideas and information put across in a communication situation.

CO 2: To get a proper hold on communication techniques needed in a situation.

CO 3: Have soft skills to work in a team for organizational development.

CO 4: Be able to analyze information and interpret a case study for application.

CO 5: To form simple reports and projects for organizational needs.

Course Content:

Topics	Hours
Unit I:	
Information Design and Development- Different kinds of technical documents, Information development life cycle, Organization structures, factors affecting information and document design, Strategies for organization, Information design and writing for print and for online media.	6
Unit II:	
Technical Writing, Grammar and Editing- Technical writing process, forms of discourse, Writing drafts and revising, Collaborative writing, creating indexes, technical writing style and language. Basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style. Introduction to advanced technical communication, Usability, Human factors, Managing technical communication projects, time estimation, Single sourcing, Localization.	8
Unit III:	
Self Development and Assessment- Self assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, career planning, Self-esteem. Managing Time; Personal memory, Rapid reading, Taking notes; Complex problem solving; Creativity.	6
Unit IV:	
Communication and Technical Writing- Public speaking, Group discussion, Oral; presentation, Interviews, Graphic presentation, Presentation aids, Personality Development. Writing reports, project proposals, brochures, newsletters, technical articles, manuals, official notes, business letters, memos, progress reports, minutes of meetings, event report.	6
Unit V:	
Ethics- Business ethics, Etiquettes in social and office settings, Email etiquettes, Telephone Etiquettes, Engineering ethics, Managing time, Role and responsibility of engineer, Work culture in jobs, Personal memory, Rapid reading, Taking notes, Complex problem solving, Creativity.	4

Suggested Readings:

1. David F. Beer and David McMurrey, *Guide to writing as an Engineer*, John Willey, New York, 2004
2. Diane Hacker, *Pocket Style Manual*, Bedford Publication, New York, 2003. (ISBN 0312406843)
3. Shiv Khera, *You Can Win*, Macmillan Books, New York, 2003.
4. Raman Sharma, *Technical Communications*, Oxford Publication, London, 2004.
5. Dale Jungk, *Applied Writing for Technicians*, McGraw Hill, New York, 2004. (ISBN: 07828357-4)
6. Sharma, R. and Mohan, K. *Business Correspondence and Report Writing*, TMH New Delhi 2002.