

# **1<sup>st</sup> Year Curriculum for B.Tech courses in Engineering & Technology**

*(Applicable from the academic session 2018-2019)*



**Maulana Abul Kalam Azad University of Technology, West Bengal**

*(Formerly West Bengal University of Technology)*

BF- 142, Sector-I, Salt Lake, Kolkata- 700064, India

**Maulana Abul Kalam Azad University of Technology, West Bengal**  
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**A. Definition of Credit:**

|                              |             |
|------------------------------|-------------|
| 1 Hr. Lecture (L) per week   | 1 credit    |
| 1 Hr. Tutorial (T) per week  | 1 credit    |
| 1 Hr. Practical (P) per week | 0.5 credits |

**B. Range of credits :**

A range of credits from 150 to 160 for a student to be eligible to get B.Tech Degree in Engineering. A student will be eligible to get B.Tech Degree *with Honours*, if he/she completes an additional 20 credits. These could be acquired through Massive Open Online Courses (MOOCs).

**C. MOOCs for B. Tech Honours**

The additional 20 credits (for obtaining B. Tech with Honours) are to be gained through MOOCs. The complete description of the MOOCs relevant for the first year course are given in *Annexure-I*. The courses for subsequent years of study will be posted subsequently.

**D. Guidelines regarding Mandatory Induction Program for the new students**

All concerned are requested to follow the guidelines given in *Annexure-II* (Notice dt.06/12/2017) concerning Mandatory Induction Program. The colleges/ Institute may also refer to the AICTE Model Curriculum for Undergraduate Degree Courses in Engineering & Technology (January 2018) -Volume I (Page No.31-38), if necessary.

**E. Mandatory Additional Requirement for earning B. Tech Degree**

All concerned are requested to follow the guidelines in *Annexure-III* concerning Mandatory Additional Requirements.

**F. Group division:**

**Group-A:**

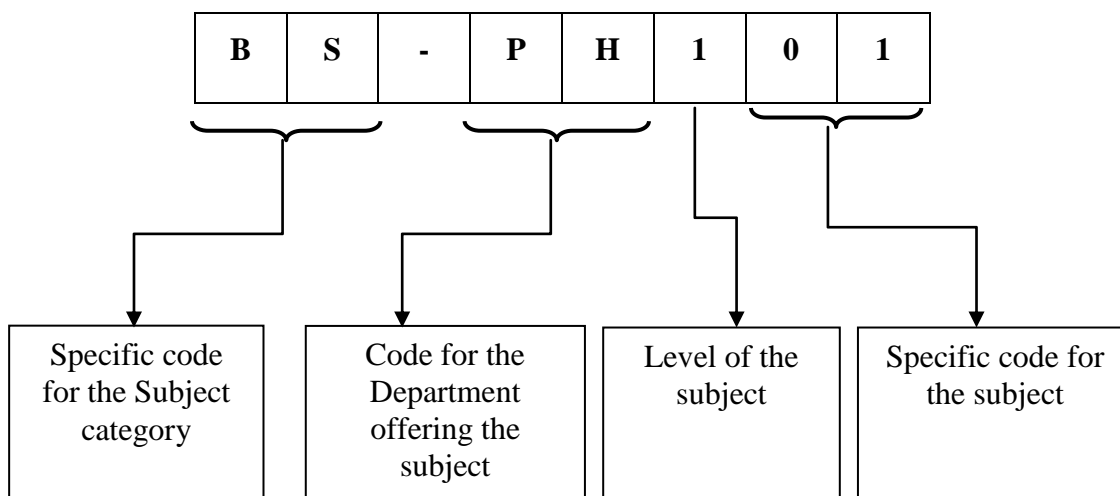
Chemistry based subjects: [Bio-Technology, Food Technology, Leather Technology, Textile Technology, Ceramic Technology, Chemical Engineering and any other Engineering that chooses to be Chemistry based] + Physics based subjects: [Mechanical Engineering, Production Engineering, Civil Engineering, Automobile Engineering, Marine Engineering, Apparel Production Engineering, Computer Science & Engineering, Information Technology.]

**Group-B:**

All Physics based subjects which are also Electrical & Electronics based [Electrical Engineering, Electronics & Communication Engineering, Applied Electronics & Instrumentation Engineering, Power Engineering, Electrical & Electronics Engineering, Bio-Medical Engineering, Instrumentation & Control Engineering]

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**G. Subject Numbering Scheme:**



| <b>List of Codes for Subject Category</b> |   |
|---|---|
| Code                                      | Category Name   |
| BS  | Basic Science Courses                                       |
| ES  | Engineering Science Courses                                 |
| HM  | Humanities and Social Sciences including Management courses |
| PC  | Professional core courses                                   |
| PE  | Professional Elective courses                               |
| OE  | Open Elective courses                                       |
| MC  | Mandatory courses   |
| PW  | Project   |

| <b>List of Codes for Departments</b> |   |      |   |
|--------------------------------------|---|------|---|
| Code                                 | Name of the Department                            | Code | Name of the Department                  |
| APM                                  | Apparel Production Engineering                    | ECE  | Electronics & Communication Engineering |
| AEIE                                 | Applied Electronics & Instrumentation Engineering | FT   | Food Technology                         |
| AUE                                  | Automobile Engineering                            | IT   | Information Technology                  |
| BME                                  | Bio-Medical Engineering                           | ICE  | Instrumentation & Control Engineering   |
| BT                                   | Bio-Technology                                    | LT   | Leather Technology                      |
| CT                                   | Ceramic Technology                                | MRE  | Marine Engineering                      |
| CHE                                  | Chemical Engineering                              | ME   | Mechanical Engineering                  |
| CE                                   | Civil Engineering                                 | PWE  | Power Engineering                       |
| CSE                                  | Computer Science & Engineering                    | PE   | Production Engineering                  |
| EEE                                  | Electrical & Electronics Engineering              | TT   | Textile Technology                      |
| EE                                   | Electrical Engineering                            |      |   |

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| <b>First Year First Semester</b>                     |                             |                       |  |                               |          |          |             |
|--|-----------------------------|-----------------------|--|-------------------------------|----------|----------|-------------|
| <b>Mandatory Induction Program- 3 weeks duration</b> |                             |                       |  |                               |          |          |             |
| Sl No.   | Category                    | Subject Code          | Subject Name   | Total Number of contact hours |          |          | Credits     |
|  |                             |                       |  | L                             | T        | P        |             |
| <b>Theory</b>  |                             |                       |  |                               |          |          |             |
| 1  | Basic Science course        | BS-PH101/<br>BS-CH101 | Physics-I (Gr-A)/<br>Chemistry-I(Gr-B)   | 3                             | 1        | 0        | 4           |
| 2  | Basic Science course        | BS-M101/<br>BS-M102   | Mathematics –IA*/<br>Mathematics –IB *   | 3                             | 1        | 0        | 4           |
| 3  | Engineering Science Courses | ES-EE101              | Basic Electrical Engineering   | 3                             | 1        | 0        | 4           |
| <i>Total Theory</i>                                  |                             |                       |  | <b>9</b>                      | <b>3</b> | <b>0</b> | <b>12</b>   |
| <b>Practical</b>                                     |                             |                       |  |                               |          |          |             |
| 1  | Basic Science course        | BS-PH191/<br>BS-CH191 | Physics-I Laboratory (Gr-A)/<br>Chemistry-I Laboratory (Gr-B)                  | 0                             | 0        | 3        | 1.5         |
| 2  | Engineering Science Courses | ES-EE191              | Basic Electrical Engineering Laboratory  | 0                             | 0        | 2        | 1           |
| 3  | Engineering Science Courses | ES-ME191/<br>ES-ME192 | Engineering Graphics & Design(Gr-B)/<br>Workshop/Manufacturing Practices(Gr-A) | 1                             | 0        | 4        | 3           |
| <i>Total Practical</i>                               |                             |                       |  | <b>1</b>                      |          | <b>9</b> | <b>5.5</b>  |
| <b>Total of First Semester</b>                       |                             |                       |  | <b>10</b>                     | <b>3</b> | <b>9</b> | <b>17.5</b> |

\* Mathematics –IA (BS-M101) - CSE & IT  
 Mathematics –IB (BS-M102) - All stream except CSE & IT

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| <b>First Year Second Semester</b> |   |                       |   |                               |          |           |             |
|-----------------------------------|---|-----------------------|---|-------------------------------|----------|-----------|-------------|
| Sl No.                            | Category  | Subject Code          | Subject Name  | Total Number of contact hours |          |           | Credits     |
|                                   |   |                       |   | L                             | T        | P         |             |
| <b>Theory</b>                     |   |                       |   |                               |          |           |             |
| 1                                 | Basic Science courses                                       | BS-PH201/<br>BS-CH201 | Physics-I (Gr-B)/<br>Chemistry-I (Gr-A)                                     | 3                             | 1        | 0         | 4           |
| 2                                 | Basic Science courses                                       | BS-M201/<br>BS-M202   | Mathematics –IIA <sup>#</sup> /<br>Mathematics –IIB <sup>#</sup>            | 3                             | 1        | 0         | 4           |
| 3                                 | Engineering Science Courses                                 | ES-CS201              | Programming for Problem Solving   | 3                             | 0        | 0         | 3           |
| 4                                 | Humanities and Social Sciences including Management courses | HM-HU201              | English   | 2                             | 0        | 0         | 2           |
| <i>Total Theory</i>               |   |                       |   | <b>11</b>                     | <b>2</b> | <b>0</b>  | <b>13</b>   |
| <b>Practical</b>                  |   |                       |   |                               |          |           |             |
| 1                                 | Basic Science courses                                       | BS-PH291/<br>BS-CH291 | Physics-I Laboratory (Gr-B)/ Chemistry-I Laboratory (Gr-A)                  | 0                             | 0        | 3         | 1.5         |
| 2                                 | Engineering Science Courses                                 | ES-CS291              | Programming for Problem Solving   | 0                             | 0        | 4         | 2           |
| 3                                 | Engineering Science Courses                                 | ES-ME291/<br>ES-ME292 | Engineering Graphics & Design(Gr-A)/ Workshop/Manufacturing Practices(Gr-B) | 1                             | 0        | 4         | 3           |
| 4                                 | Humanities and Social Sciences including Management courses | HM-HU291              | Language Laboratory   | 0                             | 0        | 2         | 1           |
| <i>Total Practical</i>            |   |                       |   | <b>1</b>                      | <b>0</b> | <b>13</b> | <b>7.5</b>  |
| <b>Total of Second Semester</b>   |   |                       |   | <b>12</b>                     | <b>2</b> | <b>13</b> | <b>20.5</b> |

# Mathematics –II (BS-M201) - CSE & IT  
Mathematics –II (BS-M202) - All stream except CSE & IT

|  | <b>Group-A</b>   | <b>Group-B</b>   |
|--|--|--|
| 1 <sup>st</sup> Year<br>1 <sup>st</sup> Semester | Physics-I (BS-PH101);<br>Workshop/Manufacturing Practices (ES-ME192) | Chemistry-I (BS-CH101);<br>Engineering Graphics & Design (ES-ME191)  |
| 1 <sup>st</sup> Year<br>2 <sup>nd</sup> Semester | Chemistry-I (BS-CH201);<br>Engineering Graphics & Design (ES-ME291)  | Physics-I (BS-PH201);<br>Workshop/Manufacturing Practices (ES-ME292) |

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|   |   |
|---|---|
| <b>Course Code :</b> BS-PH101/ BS-PH201 | <b>Category :</b> Basic Science Courses |
| <b>Course Title :</b> Physics-I         | <b>Semester :</b> First/ Second         |
| <b>L-T-P : 3-1-0</b>                    | <b>Credit:4</b>                         |
| <b>Pre-Requisites:</b>                  |   |

**Course objectives :**

Basic concepts of mechanics, optics and its applications, electricity, magnetism and qualitative understanding of concepts of quantum physics and statistical mechanics.

**1. Mechanics ( 7L)**

Problems including constraints & friction. Basic ideas of vector calculus and partial differential equations. Potential energy function  $F = -\text{grad } V$ , equipotential surfaces and meaning of gradient. Conservative and non-conservative forces. Conservation laws of energy & momentum. Non-inertial frames of reference. Harmonic oscillator; Damped harmonic motion forced oscillations and resonance. Motion of a rigid body in a plane and in 3D. Angular velocity vector. Moment of inertia.

**2. Optics (5L)**

- Distinction between interference and diffraction, Fraunhofer and Fresnel diffraction, Fraunhofer diffraction at single slit, double slit, and multiple slits ( only the expressions for max;min, & intensity and qualitative discussion of fringes); diffraction grating(resolution formulac only), characteristics of diffraction grating and its applications.
- Polarisation : Introduction, polarisation by reflection, polarisation by double reflection, scattering of light, circular and elliptical polarisation, optical activity.
- Lasers : Principles and working of laser : population inversion, pumping, various modes, threshold population inversion with examples .

**3. Electromagnetism and Dielectric Magnetic Properties of Materials (8L)**

- Maxwell's equations. Polarisation, permeability and dielectric constant, polar and non-polar dielectrics, internal fields in a solid, Clausius- Mossotti equation(expression only), applications of dielectrics.
- Magnetisation , permeability and susceptibility, classificationof magnetic materials, ferromagnetism, magnetic domains and hysteresis, applications.

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**4. Quantum Mechanics (16L)**

- Introduction to quantum physics, black body radiation, explanation using the photon concept, Compton effect, de Broglie hypothesis, wave-particle duality, verification of matter waves, uncertainty principle, Schrodinger wave equation, particle in box, quantum harmonic oscillator, hydrogen atom.

**5. Statistical Mechanics (8L)**

- Macrostate, Microstate, Density of states, Qualitative treatment of Maxwell Boltzmann, Fermi-Dirac and Bose-Einstein statistics.

**Course outcomes:**

Students will be familiar with

- Basic concepts of mechanics
- Bragg's Law and introduction to the principles of lasers, types of lasers and applications.
- Various terms related to properties of materials such as, permeability, polarization, etc.
- Some of the basic laws related to quantum mechanics as well as magnetic and dielectric properties of materials.
- Simple quantum mechanics calculations.
- 

**Learning Resources:**

1. Introduction to Electrodynamics, David J. Griffiths, Pearson Education India Learning Private Limited
2. Principles of Physics, 10ed, David Halliday, Robert Resnick Jearl Walker, Wiley
3. Electricity, Magnetism, and Light, Wayne M. Saslow, Academic Press
4. Engineering Mechanics (In SI Units) (SIE), S. Timoshenko, D.H. Young, J.V. Rao, Sukumar Pati, McGraw Hill Education
5. Classical mechanics, Narayan Rana, Pramod Joag, McGraw Hill Education
6. Introduction to Classical Mechanics, R Takwale, P Puranik, McGraw Hill Education
7. Engineering Mechanics, M.K. Harbola, Cengage India
8. An Introduction to Mechanics (SIE), David Kleppner, Robert Kolenkow, McGraw Hill Education
9. Principles of mechanics, John L. Synge and Byron A. Griffith, New York, McGraw-Hill
10. Mechanics (Dover Books on Physics), J. P. Den Hartog, Dover Publications Inc.
11. Engineering Mechanics: Dynamics, L.G. Kraige J.L. Meriam, Wiley
12. Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles, Robert Eisberg, Robert Resnick, Wiley
13. Introduction to Quantum Mechanics, J. Griffiths David, Pearson Education
14. Modern Quantum Mechanics, J. J. Sakurai, Cambridge University Press
15. Optics, Hecht, Pearson Education
16. Optics, Ghatak, McGraw Hill Education India Private Limited
17. Fundamentals of Statistical and Thermal Physics, Reif, Sarat Book Distributors
18. Statistical Mechanics, Pathria, Elsevier
19. Statistical Physics, L.D.Landau, E.M. Lifshitz, Butterworth-Heinemann

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|   |   |
|---|---|
| <b>Course Code :</b> BS-CH101/ BS-CH201 | <b>Category :</b> Basic Science Courses |
| <b>Course Title :</b> Chemistry-I       | <b>Semester :</b> First/ Second         |
| <b>L-T-P : 3-1-0</b>                    | <b>Credit:4</b>                         |
| <b>Pre-Requisites:</b>                  |   |

*Detailed contents*

**i) Atomic and molecular structure (10 lectures)**

Schrodinger equation. Particle in a box solutions and their applications for simple sample. Molecular orbitals of diatomic molecules (e.g.H<sub>2</sub>). Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

**ii) Spectroscopic techniques and applications (8 lectures)**

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering.

**iii) Intermolecular forces and potential energy surfaces (4 lectures)**

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena.

**iv) Use of free energy in chemical equilibria (8 lectures)**

First and second laws of thermodynamics and thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

**v) Periodic properties (4 Lectures)**

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

**vi) Stereochemistry (4 lectures)**

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds



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**vii) Organic reactions and synthesis of a drug molecule (4 lectures)**

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

**Course Outcomes**

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications. Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels.

The course will enable the student to:

- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Rationalise bulk properties and processes using thermodynamic considerations.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
- List major chemical reactions that are used in the synthesis of molecules.

**Learning Resources:**

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
5. Physical Chemistry, by P. W. Atkins
6. Spectroscopy of Organic Compounds, by P.S.Kalsi, New Age International Pvt Ltd Publishers
7. Physical Chemistry, P. C. Rakshit, Sarat Book House
8. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5<sup>th</sup> Edition  
<http://bcs.whfreeman.com/vollhardtshore5e/default.asp>
9. Engineering Chemistry, Satyaprakash, Khanna Book Publishing, Delhi

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|  |  |
|--|--|
| <b>Course Code :</b> BS-M101                   | <b>Category :</b> Basic Science Course |
| <b>Course Title :</b> Mathematics – I A        | <b>Semester :</b> First (CSE & IT)     |
| <b>L-T-P : 3-1-0</b>                           | <b>Credit: 4</b>                       |
| <b>Pre-Requisites: High School Mathematics</b> |  |

| <b>Module No.</b> | <b>Description of Topic</b>  | <b>Lectures Hours</b> |
|-------------------|--|-----------------------|
| 1                 | <b>Calculus (Integration):</b><br>Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.   | 8                     |
| 2                 | <b>Calculus (Differentiation):</b><br>Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin's theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.   | 6                     |
| 3                 | <b>Matrices:</b><br>Matrices, Vectors: addition and scalar multiplication, matrix multiplication; Linear systems of equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.                              | 7                     |
| 4                 | <b>Vector Spaces:</b><br>Vector Space, linear dependence of vectors, Basis, Dimension; Linear transformations (maps), Range and Kernel of a linear map, Rank and Nullity, Inverse of a linear transformation, Rank-Nullity theorem, composition of linear maps, Matrix associated with a linear map. | 9                     |
| 5                 | <b>Vector Spaces (Continued):</b><br>Eigenvalues, Eigenvectors, Symmetric, Skew-symmetric, and Orthogonal Matrices, Eigenbases.<br>Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.  | 10                    |

**Course Outcomes:**

The students will be able to:

- Apply the concept and techniques of differential and integral calculus to determine curvature and evaluation of different types of improper integrals.
- Understand the domain of applications of mean value theorems to engineering problems.
- Learn different types of matrices, concept of rank, methods of matrix inversion and their applications.
- Understand linear spaces, its basis and dimension with corresponding applications in the field of computer science.
- Learn and apply the concept of eigen values, eigen vectors, diagonalisation of matrices and orthogonalization in inner product spaces for understanding physical and engineering problems

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**Learning Resources:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. Michael Greenberg, Advanced Engineering Mathematics, Pearson.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
4. Kanti B. Dutta, Mathematical Methods of Science and Engineering, Cenage Learning.
5. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi.
6. S.K. Mapa, Higher Algebra: Abstract and Linear, Sarat Book House Pvt.Ltd.
7. Hoffman and Kunze: Linear algebra, PHI.
8. Reena Garg, Engineering Mathematics-I, Khanna Publishers.

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|  |  |
|--|--|
| <b>Course Code :</b> BS-M102                   | <b>Category :</b> Basic Science Course               |
| <b>Course Title :</b> Mathematics –I B         | <b>Semester :</b> First (All stream except CSE & IT) |
| <b>L-T-P : 3-1-0</b>                           | <b>Credit: 4</b>                                     |
| <b>Pre-Requisites: High School Mathematics</b> |  |

| <b>Module No.</b> | <b>Description of Topic</b>  | <b>Lectures Hours</b> |
|-------------------|--|-----------------------|
| 1                 | <b><i>Calculus (Integration):</i></b><br>Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.  | 8                     |
| 2                 | <b><i>Calculus (Differentiation):</i></b><br>Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin's theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.  | 6                     |
| 3                 | <b><i>Sequence and Series:</i></b><br>Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.                          | 11                    |
| 4                 | <b><i>Multivariate Calculus:</i></b><br>Limit, continuity and partial derivatives, Directional derivatives, Total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, Curl and Divergence.                                  | 9                     |
| 5                 | <b><i>Matrices:</i></b><br>Inverse and rank of a matrix, Rank-nullity theorem; System of linear equations; Symmetric, Skew-symmetric and Orthogonal matrices; Determinants; Eigenvalues and Eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation. | 8                     |

**Course Outcomes:**

After completing the course the student will be able to

- Apply the concept and techniques of differential and integral calculus to determine curvature and evaluation of different types of improper integrals.
- Understand the domain of applications of mean value theorems to engineering problems.
- Learn the tools of power series and Fourier series to analyze engineering problems and apply the concept of convergence of infinite series in many approximation techniques in engineering disciplines.
- Apply the knowledge for addressing the real life problems which comprises of several variables or attributes and identify extremum points of different surfaces of higher dimensions.

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- Understand different types of matrices, their eigen values, eigen vectors, rank and also their orthogonal transformations which are essential for understanding physical and engineering problems.

**Learning Resources:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. Michael Greenberg, Advanced Engineering Mathematics, Pearson.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
4. Kanti B. Dutta, Mathematical Methods of Science and Engineering, Cenage Learning.
5. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi.
6. Reena Garg, Engineering Mathematics-I, Khanna Publishers.

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|  |   |
|--|---|
| <b>Course Code :</b> ES-EE101                      | <b>Category :</b> Engineering Science Courses |
| <b>Course Title :</b> Basic Electrical Engineering | <b>Semester :</b> First                       |
| <b>L-T-P : 3-1-0</b>                               | <b>Credit: 4</b>                              |
| <b>Pre-Requisites:</b>                             |   |

*Detailed contents:*

**Module 1: DC Circuits (8 hours)**

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

**Module 2: AC Circuits (8 hours)**

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

**Module 3: Transformers (6 hours)**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

**Module 4: Electrical Machines (8 hours)**

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

**Module 5: Power Converters (6 hours)**

DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.

**Module 6: Electrical Installations (6 hours)**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

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**Course Outcomes**

- To understand and analyze basic electric and magnetic circuits
- To study the working principles of electrical machines and power converters.
- To introduce the components of low voltage electrical installations

**Learning Recourses:**

1. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
3. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
4. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
5. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.
6. Ritu Sahdev, Basic Electrical Engineering, Khanna Book Publishing Co. (P) Ltd., Delhi.

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|  |  |
|--|--|
| <b>Course Code :</b> BS-PH191/ BS-PH291    | <b>Category :</b> Basic Science course |
| <b>Course Title :</b> Physics-I Laboratory | <b>Semester :</b> First/ Second        |
| <b>L-T-P : 0-0-3</b>                       | <b>Credit:1.5</b>                      |
| <b>Pre-Requisites:</b>                     |  |

**Choose 10 experiments including at least one from Optics, Electricity and Magnetism and Quantum Mechanics and at least a total of six from these three groups.**

### **Experiments in Optics**

1. Determination of dispersive power of the material of a prism
2. Determination of wavelength of a monochromatic light by Newton's ring
3. Determination of wavelength of a monochromatic light by Fresnel's bi-prism
4. Determination of wavelength of the given laser source by diffraction method

### **Electricity & Magnetism experiments**

1. Determination of thermo electric power of a given thermocouple.
2. Determination of specific charge (e/m) of electron by J.J. Thompson's method.
3. Determination of dielectric constant of a given dielectric material.
4. Determination of Hall coefficient of a semiconductor by four probe method.
5. To study current voltage characteristics, load response, areal characteristic and spectral response of a photovoltaic solar cell.
6. Determination of resistance of ballistic galvanometer by half deflection method and study of variation of logarithmic decrement with series resistance.
7. Determination of unknown resistance using Carey Foster's bridge
8. Study of Transient Response in LR, RC and LCR circuits using expeyes
9. Generating sound from electrical energy using expeyes

### **Experiments in Quantum Physics**

1. Determination of Stefan-Boltzmann constant.
2. Determination of Planck constant using photocell.
3. Determination of Lande-g factor using Electron spin resonance spectrometer.
4. Determination of Rydberg constant by studying Hydrogen spectrum.
5. Determination of Band gap of semiconductor.
6. To study current voltage characteristics, load response, areal characteristic and spectral response of a photovoltaic solar cell.

### **Miscellaneous experiments**

1. Determination of Young's modulus of elasticity of the material of a bar by the method of flexure
2. Determination of bending moment and shear force of a rectangular beam of uniform cross-section
3. Determination of modulus of rigidity of the material of a rod by static method
4. Determination of rigidity modulus of the material of a wire by dynamic method
5. To determine the moment of inertia of a body about an axis passing through its centre of gravity and to determine the modulus of rigidity of the material of the suspended wire
6. Determination of coefficient of viscosity by Poiseuille's capillary flow method



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|  |   |
|--|---|
| <b>Course Code :</b> BS-CH191/ BS-CH291      | <b>Category :</b> Basic Science Courses |
| <b>Course Title :</b> Chemistry-I Laboratory | <b>Semester :</b> First/ Second         |
| <b>L-T-P : 0-0-3</b>                         | <b>Credit:1.5</b>                       |
| <b>Pre-Requisites:</b>                       |   |

**Choose 10 experiments from the following:**

1. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution.
2. pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution.
3. Determination of dissolved oxygen present in a given water sample.
4. To determine chloride ion in a given water sample by Argentometric method (using chromate indicator solution)
5. Determination of surface tension and viscosity
6. Thin layer chromatography
7. Ion exchange column for removal of hardness of water
8. Determination of the rate constant of a reaction
9. Determination of cell constant and conductance of solutions
10. Potentiometry - determination of redox potentials and emfs
11. Saponification/acid value of an oil
12. Chemical analysis of a salt
13. Determination of the partition coefficient of a substance between two immiscible liquids
14. Adsorption of acetic acid by charcoal
15. Use of the capillary viscosimeters to demonstrate the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg .

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|   |   |
|---|---|
| <b>Course Code :</b> ES-EE291                                 | <b>Category :</b> Engineering Science Courses |
| <b>Course Title :</b> Basic Electrical Engineering Laboratory | <b>Semester :</b> First                       |
| <b>L-T-P : 0-0-2</b>  | <b>Credit: 1</b>                              |
| <b>Pre-Requisites:</b>  |   |

**Choose 10 experiments from the following:**

1. First activity: Introduction to basic safety precautions and mentioning of the do's and Don'ts. Noting down list of experiments to be performed, and instruction for writing the laboratory reports by the students. Group formation. Students are to be informed about the modalities of evaluation.
2. Introduction and uses of following instruments :
  - (a) Voltmeter
  - (b) Ammeter
  - (c) Multimeter
  - (d) Oscilloscope

Demonstration of real life resistors, capacitors with color code , inductors and autotransformer.

3. Demonstration of cut-out sections of machines: DC machine, Induction machine, Synchronous machine and single phase induction machine.
4. Calibration of ammeter and Wattmeter.
5. Determination of steady state and transient response of R-L, R-C and R-L-C circuit to a step change in voltage.
6. Determination of steady state response of R-L and R-C and R-L-C circuit and calculation of impedance and power factor.
7. Determination of resonance frequency and quality factor of series and parallel R-L-C circuit.
8. (a) Open circuit and short circuit test of a single-phase transformer  
 (b) Load test of the transformer and determination of efficiency and regulation
9. Demonstration of three phase transformer connections. Voltage and current relationship, phase shifts between the primary and secondary side.
10. Measurement of power in a three phase unbalanced circuit by two wattmeter method.
11. Determination of Torque –Speed characteristics of separately excited DC motor.
12. Determination of Torque speed characteristics and observation of direction reversal by change of phase sequence of connection of Induction motor.
13. Determination of operating characteristics of Synchronous generator.
14. Demonstration of operation of (a) DC-DC converter (b) DC-AC converter (c) DC-AC converter for speed control of an Induction motor
15. Demonstration of components of LT switchgear.

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|   |   |
|---|---|
| <b>Course Code :</b> ES-ME191/ ES-ME 291            | <b>Category :</b> Engineering Science Courses |
| <b>Course Title :</b> Engineering Graphics & Design | <b>Semester :</b> First/ Second               |
| <b>L-T-P : 1-0-4</b>                                | <b>Credit: 3</b>                              |
| <b>Pre-Requisites:</b>                              |   |

| Sl. No. | Content   | Lecture (L) | Practical (P) |
|---------|---|-------------|---------------|
| 1       | <b>INTRODUCTION TO ENGINEERING DRAWING</b><br>Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Different types of lines and their use; Drawing standards and codes.  | 1           | 4             |
| 2       | <b>LETTERING, DIMENSIONING, SCALES</b><br>Plain scale, Diagonal scale and Vernier Scales.   | 1           | 4             |
| 3       | <b>GEOMETRICAL CONSTRUCTION AND CURVES</b><br>Construction of polygons, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid, Involute, Archimedean Spiral.   | 1           | 4             |
| 4       | <b>PROJECTION OF POINTS, LINES, SURFACES</b><br>Principles of Orthographic Projections-Conventions - 1st and 3rd angle projection, Projections of Points and lines inclined to both planes; Projections of planes (Rectangle, pentagon, Hexagon etc.) inclined Planes - Auxiliary Planes. | 1           | 4             |
| 5       | <b>PROJECTION OF REGULAR SOLIDS</b><br>Regular solids inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale (Cube, Pyramid, Prism, Cylinder, Cone).  | 1           | 4             |
| 6       | <b>COMBINATION OF REGULAR SOLIDS, FLOOR PLANS</b><br>Regular solids in mutual contact with each other like Spheres in contact with cones standing on their base. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.                              | 1           | 4             |
| 7       | <b>ISOMETRIC PROJECTIONS</b><br>Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;                        | 1           | 4             |

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|----|--|---|---|
| 8  | <p><b>SECTIONS AND SECTIONAL VIEWS OF RIGHT ANGULAR SOLIDS</b></p> <p>Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)</p>  | 1 | 4 |
| 9  | <p><b>OVERVIEW OF COMPUTER GRAPHICS, CUSTOMISATION &amp; CAD DRAWING</b></p> <p>listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids]; Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;</p> | 1 | 4 |
| 10 | <p><b>ANNOTATIONS, LAYERING &amp; OTHER FUNCTIONS</b></p> <p>applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling;</p>               | 2 | 8 |

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|    |  |   |   |
|----|--|---|---|
| 11 | <p><b>DEMONSTRATION OF A SIMPLE TEAM DESIGN PROJECT</b></p> <p>Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).</p> | 2 | 8 |
|----|--|---|---|

**Course Outcomes**

The student will learn:

- Introduction to engineering design and its place in society
- Exposure to the visual aspects of engineering design
- Exposure to engineering graphics standards
- Exposure to solid modelling

**General Instructions**

1. In every topic some problems are to be done in the class and some are to be given to students as home assignment.
2. The problems for class work are to be prepared on drawing sheet of A1 size in the class/ using AutoCAD software.
3. The problems for home assignments are to be prepared on drawing copy/ using AutoCAD software.
4. Print out of every assignment is to be taken for CAD Drawings on Drawing sheets (A4 Sheets).
5. A title block must be prepared in each sheet/ assignment.

Following is the list of drawing instruments that required for making engineering drawings on paper with perfection.

1. Drawing Board
2. Mini drafter/ Set-squares (45°–45° & 60°–90°), T-square
3. Protractor (180°, 360°)
4. Scales (Plain, Diagonal)
5. Compass (Small and Large)
6. Divider (Small and Large)

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7. French Curves
8. Drawing paper (A1 Size)
9. Drawing pencil (H, HB, B)
10. Sharpener
11. Eraser
12. Drawing pins & clips
13. Duster or handkerchief etc.

**Learning Resources:**

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
3. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
4. Narayana, K.L. & P Kanniah (2008), Text book on Engineering Drawing, Scitech Publishers
5. Corresponding set of CAD Software Theory and User Manuals
6. Pradeep Jain, Ankita Maheswari, A.P. Gautam, Engineering Graphics & Design, Khanna Publishing House

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|   |   |
|---|---|
| <b>Course Code :</b> ES-ME192/ ES-ME 292                | <b>Category :</b> Engineering Science Courses |
| <b>Course Title :</b> Workshop/ Manufacturing Practices | <b>Semester :</b> First/ Second               |
| <b>L-T-P : 1-0-4</b>                                    | <b>Credit:3</b>                               |
| <b>Pre-Requisites:</b>                                  |   |

**(i) Lectures & videos:**

Detailed contents:

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods
2. CNC machining, Additive manufacturing
3. Fitting operations & power tools
4. Electrical & Electronics
5. Carpentry
6. Plastic moulding, glass cutting
7. Metal casting
8. Welding (arc welding & gas welding), brazing

**(ii) Workshop Practice:**

• **Machine shop (8 hours)**

*Typical jobs that may be made in this practice module:*

- To make a pin from a mild steel rod in a lathe.
- To make rectangular and vee slot in a block of cast iron or mild steel in a shaping and / or milling machine.

• **Fitting shop (8 hours)**

*Typical jobs that may be made in this practice module:*

- To make a Gauge from MS plate.

• **Carpentry (8 hours)**

*Typical jobs that may be made in this practice module:*

- To make wooden joints and/or a pattern or like.

• **Welding shop (8 hours (Arc welding 4 hrs + gas welding 4 hrs))**

*Typical jobs that may be made in this practice module:*

- ARC WELDING (4 hours): To join two thick (approx 6mm) MS plates by manual metal arc welding.
- GAS WELDING (4 hours): To join two thin mild steel plates or sheets by gas welding.

• **Casting (8 hours)**

*Typical jobs that may be made in this practice module:*

- One/ two green sand moulds to prepare, and a casting be demonstrated.

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- **Smithy (4 hours) ~ 4 hours**

*Typical jobs that may be made in this practice module:*

- A simple job of making a square rod from a round bar or like.

- **Plastic moulding & Glass cutting (4 hours)**

*Typical jobs that may be made in this practice module:*

- For plastic moulding, making at least one simple plastic component should be made.
- For glass cutting, three rectangular glass pieces may be cut to make a kaleidoscope using a black colour diamond cutter, or similar other components may be made.

- **Electrical & Electronics (8 hours)**

- Familiarization with LT switchgear elements, making its sketches and noting down its specification. Kitkat fuse, Glass cartridge fuse, Plastic fuse holders (optional), Iron clad isolators, MCB style isolators, Single phase MCB, Single-phase wire, wiring cable.
- Demonstration of domestic wiring involving two MCB, two piano key switches, one incandescent lamp, one LED lamp and plug point.
- Simple wiring exercise to be executed to understand the basic electrical circuit.
- Simple soldering exercises to be executed to understand the basic process of soldering.
- Fabrication of a single-phase full wave rectifier with a step down transformer using four diodes and electrolytic capacitor and to find its volt-ampere characteristics to understand basic electronic circuit fabrication.

**Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.**

### **Laboratory Outcomes**

- Upon completion of this laboratory course, students will be able to fabricate components with their own hands.
- They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
- By assembling different components, they will be able to produce small devices of their interest.

### **Learning Resources:**

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., “Elements of Workshop Technology”, Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. and Steven S. Schmid, “Manufacturing Engineering and Technology”, 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 McGrawHill House, 2017.



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|  |  |
|--|--|
| <b>Course Code :</b> BS-M201                               | <b>Category :</b> Basic Science Course |
| <b>Course Title :</b> Mathematics – II A                   | <b>Semester :</b> Second (CSE &IT)     |
| <b>L-T-P : 3-1-0</b>                                       | <b>Credit: 4</b>                       |
| <b>Pre-Requisites:</b> High School Mathematics and BS-M101 |  |

| <b>Module No.</b> | <b>Description of Topic</b>  | <b>Lectures Hours</b> |
|-------------------|--|-----------------------|
| 1                 | <b>Basic Probability:</b> Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the Multinomial distribution, Poisson approximation to the Binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality. | 11                    |
| 2                 | <b>Continuous Probability Distributions:</b> Continuous random variables and their properties, Distribution functions and densities, Normal, Exponential and Gamma densities.  | 4                     |
| 3                 | <b>Bivariate Distributions:</b> Bivariate distributions and their properties, distribution of sums and quotients, Conditional densities, Bayes' rule.  | 5                     |
| 4                 | <b>Basic Statistics:</b> Measures of Central tendency, Moments, Skewness and Kurtosis, Probability distributions: Binomial, Poisson and Normal and evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.  | 8                     |
| 5                 | <b>Applied Statistics:</b> Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.  | 8                     |
| 6                 | <b>Small samples:</b> Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.  | 4                     |

**Course Outcomes:**

The students will be able to:

- Learn the ideas of probability and random variables, various discrete and continuous probability distributions with their properties and their applications in physical and engineering environment.

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- Understand the basic ideas of statistics with different characterisation of a univariate and bivariate data set.
- Apply statistical tools for analysing data samples and drawing inference on a given data set.

**Learning Resources:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons
2. S. Ross, A First Course in Probability, Pearson Education India
3. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, Wiley.
4. John E. Freund, Ronald E. Walpole, Mathematical Statistics, Prentice Hall.
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
6. N.G. Das, Statistical Methods (Combined Volume), Tata-McGraw Hill.
7. Reena Garg, Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishers.

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|   |   |
|---|---|
| <b>Course Code</b> : BS-M202                                | <b>Category</b> : Basic Science Course                |
| <b>Course Title</b> : Mathematics – II B                    | <b>Semester</b> : Second (All stream except CSE & IT) |
| <b>L-T-P</b> : 3-1-0  | <b>Credit</b> : 4                                     |
| <b>Pre-Requisites</b> : High School Mathematics and BS-M102 |   |

| Module No. | Description of Topic   | Lectures Hours |
|------------|--|----------------|
| 1          | <b><i>Multivariate Calculus (Integration):</i></b><br>Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, change of variables (Cartesian to Polar), Applications: Areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), Orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes. | 11             |
| 2          | <b><i>First order ordinary differential equations:</i></b><br>Exact, linear and Bernoulli's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.  | 5              |
| 3          | <b><i>Ordinary differential equations of higher orders:</i></b><br>Second order linear differential equations with constant coefficients, Use of D-operators, Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.  | 9              |
| 4          | <b><i>Complex Variable – Differentiation</i></b><br>Differentiation of complex functions, Cauchy-Riemann equations, Analytic functions, Harmonic functions, determination of harmonic conjugate, elementary analytic functions (exponential, trigonometric, logarithmic) and their properties; Conformal mappings, Mobius transformations and their properties.  | 6              |
| 5          | <b><i>Complex Variable – Integration</i></b><br>Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, Zeros of analytic functions, Singularities, Laurent's series; Residues, Cauchy residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.  | 9              |

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**Course Outcomes:**

The students will be able to:

- Learn the methods for evaluating multiple integrals and their applications to different physical problems.
- Understand different techniques to solve first and second order ordinary differential equations with its formulation to address the modelling of systems and problems of engineering sciences.
- Learn different tools of differentiation and integration of functions of a complex variable that are used with various other techniques for solving engineering problems.
- Apply different types of transformations between two 2- dimensional planes for analysis of physical or engineering problems.

**Learning Resources:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. Michael Greenberg, Advanced Engineering Mathematics, Pearson.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
4. Kanti B. Dutta, Mathematical Methods of Science and Engineering, Cenage Learning.
5. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi.
6. E. L. Ince, Ordinary Differential Equations, Dover Publications.
7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, Mc-Graw Hill.
8. Reena Garg, Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishers.

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|   |   |
|---|---|
| <b>Course Code</b> : ES-CS201                         | <b>Category</b> : Engineering Science Courses |
| <b>Course Title</b> : Programming for Problem Solving | <b>Semester</b> : Second                      |
| <b>L-T-P</b> : 3-0-0                                  | <b>Credit</b> :3                              |
| <b>Pre-Requisites:</b>                                |   |

*Detailed contents*

**Unit 1: Introduction to Programming (4 lectures)**

- Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) - **(1 lecture)**.
- Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. **(1 lecture)**
- From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code- **(2 lectures)**

**Unit 2: Arithmetic expressions and precedence (2 lectures)**

**Unit 3: Conditional Branching and Loops (6 lectures)**

- Writing and evaluation of conditionals and consequent branching **(3 lectures)**
- Iteration and loops **(3 lectures)**

**Unit 4: Arrays (6 lectures)**

- Arrays (1-D, 2-D), Character arrays and Strings

**Unit 5: Basic Algorithms (6 lectures)**

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

**Unit 6: Function (5 lectures)**

- Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

**Unit 7: Recursion (4 -5 lectures)**

- Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

**Unit 8: Structure (4 lectures)**

- Structures, Defining structures and Array of Structures

**Unit 9: Pointers (2 lectures)**

- Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

**Unit 10: File handling (only if time is available, otherwise should be done as part of the lab)**

**Maulana Abul Kalam Azad University of Technology, West Bengal**  
*(Formerly West Bengal University of Technology)*  
**1<sup>st</sup> Year Curriculum Structure for B.Tech courses in Engineering & Technology**  
(Applicable from the academic session 2018-2019)

**Course Outcomes**

The student will learn

- To formulate simple algorithms for arithmetic and logical problems.
- To translate the algorithms to programs (in C language).
- To test and execute the programs and correct syntax and logical errors.
- To implement conditional branching, iteration and recursion.
- To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
- To use arrays, pointers and structures to formulate algorithms and programs.
- To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
- To apply programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.

**Learning Resources:**

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
4. R. S. Salaria, Computer Concepts and Programming in C, Khanna Publishers

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**1<sup>st</sup> Year Curriculum Structure for B.Tech courses in Engineering & Technology**  
 (Applicable from the academic session 2018-2019)

|   |   |
|---|---|
| <b>Course Code :</b> ES-CS291                         | <b>Category :</b> Engineering Science Courses |
| <b>Course Title :</b> Programming for Problem Solving | <b>Semester :</b> Second                      |
| <b>L-T-P : 0-0-4</b>                                  | <b>Credit:2</b>                               |
| <b>Pre-Requisites:</b>                                |   |

*The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.*

**Tutorial 1:** Problem solving using computers:

**Lab1:** Familiarization with programming environment

**Tutorial 2:** Variable types and type conversions:

**Lab 2:** Simple computational problems using arithmetic expressions

**Tutorial 3:** Branching and logical expressions:

**Lab 3:** Problems involving if-then-else structures

**Tutorial 4:** Loops, while and for loops:

**Lab 4:** Iterative problems e.g., sum of series

**Tutorial 5:** 1D Arrays: searching, sorting:

**Lab 5:** 1D Array manipulation

**Tutorial 6:** 2D arrays and Strings

**Lab 6:** Matrix problems, String operations

**Tutorial 7:** Functions, call by value:

**Lab 7:** Simple functions

**Tutorial 8 &9:** Numerical methods (Root finding, numerical differentiation, numerical integration):

**Lab 8 and 9:** Programming for solving Numerical methods problems

**Tutorial 10:** Recursion, structure of recursive calls

**Lab 10:** Recursive functions

**Tutorial 11:** Pointers, structures and dynamic memory allocation

**Lab 11:** Pointers and structures

**Tutorial 12:** File handling:

**Lab 12:** File operations

**Laboratory Outcomes**

- To formulate the algorithms for simple problems
- To translate given algorithms to a working and correct program
- To be able to correct syntax errors as reported by the compilers
- To be able to identify and correct logical errors encountered at run time
- To be able to write iterative as well as recursive programs
- To be able to represent data in arrays, strings and structures and manipulate them through a program
- To be able to declare pointers of different types and use them in defining self-referential structures.
- To be able to create, read and write to and from simple text files.

**Maulana Abul Kalam Azad University of Technology, West Bengal**  
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**1<sup>st</sup> Year Curriculum Structure for B.Tech courses in Engineering & Technology**  
(Applicable from the academic session 2018-2019)

|                               |   |
|-------------------------------|---|
| <b>Course Code :</b> HM-HU201 | <b>Category :</b> Humanities and Social Sciences including Management courses |
| <b>Course Title :</b> English | <b>Semester :</b> Second  |
| <b>L-T-P : 2-0-0</b>          | <b>Credit:2</b>   |
| <b>Pre-Requisites:</b>        |   |

*Detailed contents*

**1. Vocabulary Building**

- 1.1 The concept of Word Formation
- 1.2 Root words from foreign languages and their use in English
- 1.3 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.
- 1.4 Synonyms, antonyms, and standard abbreviations.

**2. Basic Writing Skills**

- 2.1 Sentence Structures
- 2.2 Use of phrases and clauses in sentences
- 2.3 Importance of proper punctuation
- 2.4 Creating coherence
- 2.5 Organizing principles of paragraphs in documents
- 2.6 Techniques for writing precisely

**3. Identifying Common Errors in Writing**

- 3.1 Subject-verb agreement
- 3.2 Noun-pronoun agreement
- 3.3 Misplaced modifiers
- 3.4 Articles
- 3.5 Prepositions
- 3.6 Redundancies
- 3.7 Clichés

**4. Nature and Style of sensible Writing**

- 4.1 Describing
- 4.2 Defining
- 4.3 Classifying
- 4.4 Providing examples or evidence
- 4.5 Writing introduction and conclusion



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## **5. Writing Practices**

5.1 Comprehension

5.2 Précis Writing

5.3 Essay Writing

## **6. Oral Communication**

(This unit involves interactive practice sessions in Language Lab)

- Listening Comprehension
- Pronunciation, Intonation, Stress and Rhythm
- Common Everyday Situations: Conversations and Dialogues
- Communication at Workplace
- Interviews
- Formal Presentations

### **Learning Resources:**

(i) Practical English Usage. Michael Swan. OUP. 1995.

(ii) Remedial English Grammar. F.T. Wood. Macmillan.2007

(iii) On Writing Well. William Zinsser. Harper Resource Book. 2001

(iv) Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.

(v) Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.

(vi) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

(vii) Kulbushan Kumar, R S Salaria, Effective Communication Skills, Khanna Publishing House, Delhi.

### **Course Outcomes**

The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

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 (Applicable from the academic session 2018-2019)

|   |   |
|---|---|
| <b>Course Code :</b> HM-HU291             | <b>Category :</b> Humanities and Social Sciences including Management courses |
| <b>Course Title :</b> Language Laboratory | <b>Semester :</b> Second  |
| <b>L-T-P : 0-0-2</b>                      | <b>Credit:1</b>   |
| <b>Pre-Requisites:</b>                    |   |

- |   |    |
|---|----|
| 1) Honing ‘Listening Skill’ and its sub skills through Language Lab Audio device;   | 3P |
| 2) Honing ‘Speaking Skill’ and its sub skills   | 2P |
| 3) Helping them master Linguistic/Paralinguistic features (Pronunciation/Phonetics/<br>Voice modulation/ Stress/ Intonation/ Pitch &Accent) of connected speech                                 | 2P |
| 4) Honing ‘Conversation Skill’ using Language Lab Audio –Visual input;<br>Conversational Practice Sessions (Face to Face / via Telephone, Mobile phone &<br>Role Play Mode)                     | 2P |
| 5) Introducing ‘Group Discussion’ through audio –Visual input and acquainting them<br>with key strategies for success   | 2P |
| 6) G D Practice Sessions for helping them internalize basic Principles<br>(turn- taking, creative intervention, by using correct body language, courtesies &<br>other soft skills) of GD        | 4P |
| 7) Honing ‘Reading Skills’ and its sub skills using Visual / Graphics/<br>Diagrams /Chart Display/Technical/Non Technical Passages<br>Learning Global / Contextual / Inferential Comprehension; | 2P |
| 8) Honing ‘Writing Skill’ and its sub skills by using<br>Language Lab Audio –Visual input; Practice Sessions  | 2P |

**Course Outcomes**

- The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

# **MOOCs for B. Tech Honours**



**Maulana Abul Kalam Azad University of Technology, West Bengal**

*(Formerly West Bengal University of Technology)*

BF- 142, Sector-I, Salt Lake, Kolkata- 700064, India

# Maulana Abul Kalam Azad University of Technology, West Bengal

## Notice

1<sup>st</sup> May, 2018

### MOOCs for B.Tech Honours (Applicable from the session 2018-2019)

#### Preamble

All India Council for Technical Education (AICTE) has introduced Model Curriculum for Bachelor of Technology programme with 160 credits in the entire programme of 4 years, and additional 20 credits will be required to be done for the degree of Bachelor of Technology with Honours. These additional 20 credits will have to be acquired with online courses (MOOCs) as per AICTE. So students will have to complete additional 20 credits through MOOCs within 4 years of time. This creates an excellent opportunity for students to acquire the necessary skill set for employability through massive online courses where the rare expertise of world famous experts from academics and industry are available. Maulana Abul Kalam Azad University of Technology, West Bengal (MAKAUT,WB) has thus decided to introduce AICTE model curriculum for its B.Tech Programmes and suggest baskets for MOOCs available year wise for the four-year long B.Tech programme from the sessions 2018-2019. The basket for MOOCs will be a dynamic one, as courses keep on updating with time. Few essential skill sets required for employability are also identified year wise by MAKAUT,WB. For MOOCs platforms where examination or assessment is absent (like SWAYAM) or where certification is costly (like Coursera or edX), faculty members of the Institutes are to audit the courses and prepare the examination question papers, for the courses undertaken by the students of respective Institutes, so that MAKAUT,WB can conduct examination for the course. The total of 20 credits that is required to be attained for B.Tech Honours degree are distributed over four years in the following way:

|                 |   |           |
|-----------------|---|-----------|
| For first year  | : | 8 credits |
| For second year | : | 4 credits |
| For third year  | : | 4 credits |
| For fourth year | : | 4 credits |

A student of first year has to cover courses from at least three skills :

1. Computer Programing with Python / R
2. Soft skill
3. Ethics

Courses are \* marked in the above areas

If a student is unable to cover the credits assigned for the first year, he/she can do these courses in either of the subsequent years, but he/she has to choose the courses from the basket of MOOCs announced by MAKAUT,WB from time to time. The same rule will be applicable for the other years of the programme.

The basket for MOOCs for the 1<sup>st</sup> year B. Tech for the session 2018-2019 are made available herewith.

By order.

## MOOCs for First Year, Engineering and Technology

| Sl. No | Course   | Provider   | Duration | Credits | Name of University / Institution           |
|--------|--|------------|----------|---------|--|
| 1.     | Presentation Skills: Designing Presentation Slides   | Coursera * | 4 weeks  | 1       | Tomsk State University                     |
| 2.     | Effective Problem-Solving and Decision-Making        | Coursera   | 4 weeks  | 1       | University of California                   |
| 3.     | Communication in the 21st Century Workplace          | Coursera * | 4 weeks  | 1       | University of California                   |
| 4.     | Psychology at Work                                   | Coursera * | 6 weeks  | 2       | University of Western Australia            |
| 5.     | Critical Thinking & Problem Solving                  | EdX *      | 3 weeks  | 3       | Rochester Institute of Technology          |
| 6.     | Successful Career Development                        | Coursera   | 7 weeks  | 2       | University System of Georgia               |
| 7.     | Working in Teams: A Practical Guide                  | edX        | 4 weeks  | 1       | University of Queensland                   |
| 8.     | Communication theory: bridging academia and practice | Coursera   | 9 weeks  | 3       | Higher School of Economics                 |
| 9.     | Speaking Effectively                                 | NPTEL *    | 8 weeks  | 3       | Indian Institute of Technology, Kharagpur  |
| 10.    | Introduction to Philosophy                           | Coursera   | 5 weeks  | 1       | University of Edinburgh                    |
| 11.    | Moralities of Everyday Life                          | Coursera   | 6 weeks  | 2       | Yale University                            |
| 12.    | Introduction to Logic                                | Coursera * | 10 weeks | 3       | Stanford University                        |
| 13     | Write Professional Emails in English                 | Coursera * | 5 weeks  | 2       | Georgia Institute of Technology            |
| 14     | Technical Writing                                    | Coursera   | 5 weeks  | 1       | Moscow Institute of Physics and Technology |
| 15     | Learn to Program: The Fundamentals                   | Coursera   | 7 weeks  | 2       | University of Toronto                      |
| 16     | The Science of Everyday Thinking                     | edX        | 12 weeks | 4       | University of Queensland                   |
| 17     | Introduction to Problem Solving and Programming      | NPTEL      | 12 weeks | 4       | NPTEL                                      |
| 18     | The Science of Well Being                            | Coursera   | 6 weeks  | 2       | Yale University                            |
| 19     | Developing Soft Skills and Personality               | NPTEL      | 8 weeks  | 3       |  |
| 20     | Programming Basics                                   | edX        | 9 weeks  | 3       | IIT Bombay                                 |
| 21     | Introduction to Python: Absolute Beginner            | EdX *      | 5 weeks  | 2       | Microsoft                                  |
| 22     | Inferential Statistics                               | Coursera * | 7 weeks  | 2       | University of Amsterdam                    |
| 23     | Linear Regression and Modelling                      | Coursera   | 4 weeks  | 1       | Duke University                            |
| 24     | Foundation of Data Structures                        | edX        | 6 weeks  | 2       | IIT Bombay                                 |
| 25     | Introduction to Logic                                | NPTEL      | 12 weeks | 4       | NPTEL                                      |
| 26     | Introduction to Probability and Data                 | Coursera * | 5 weeks  | 1       | Duke University                            |
| 27     | Ethics   | NPTEL *    | 12 weeks | 4       |  |
| 28     | Science, Technology and Society                      | NPTEL      | 12 weeks | 4       |  |
| 29     | Creating Innovation                                  | Coursera   | 6 weeks  | 2       | Macquarie University                       |
| 30     | Ethical Leadership Through Giving Voice to Values    | Coursera * | 4 weeks  | 2       | University of Virginia                     |
| 31     | Creativity, Innovation, and Change                   | Coursera * | 6 weeks  | 2       | Pennsylvania State University              |
| 32     | Interpersonal Communication for Engineering Leaders  | Coursera   | 4 weeks  | 1       | Rice University                            |

|    |  |            |            |   |   |
|----|--|------------|------------|---|---|
| 33 | Learn to Program: The Fundamentals   | Coursera * | 7 weeks    | 3 | University of Toronto   |
| 34 | Introduction to Mathematical Thinking  | Coursera * | 9 weeks    | 3 | Stanford University   |
| 35 | The Science of Everyday Thinking   | edX        | 12 weeks   | 4 | University of Queensland  |
| 36 | A Life of Happiness and Fulfillment  | Coursera   | 6 weeks    | 2 | Indian School of Business   |
| 37 | Model Thinking   | Coursera   | 12 weeks   | 4 | University of Michigan  |
| 38 | Introduction to Philosophy: God, Knowledge, and Consciousness                  | edX        | 12 weeks   | 4 | MIT   |
| 39 | Soft skills  | NPTEL *    | 12 Weeks   | 4 | IIT Roorkee   |
| 40 | Developing Soft Skills and Personality   | NPTEL *    | 8 weeks    | 3 | IIT Kanpur  |
| 41 | Indian Fiction in English  | NPTEL      | 12 Weeks   | 4 | IIT Madras  |
| 42 | Development of Sociology in India  | NPTEL      | 4 Weeks    | 1 | IIT Kanpur  |
| 43 | Intellectual Property  | NPTEL      | 12 Weeks   | 4 | IIT Madras  |
| 44 | Essential Statistics for Data Analysis using Excel                             | EdX *      | Self Paced | 3 | Microsoft   |
| 45 | Ethics and Law in Data and Analytics   | edX        | Self Paced | 4 | Microsoft   |
| 46 | Climate Change Mitigation in Developing Countries                              | Coursera * | 6 weeks    | 3 | University of Cape town   |
| 47 | Web Design for Everybody (Basics of Web Development and Coding) Specialization | Coursera   | 15weeks    | 4 | University of Michigan  |
| 48 | Ecology: Ecosystem Dynamics and Conservation                                   | Coursera   | 5 weeks    | 1 | American Museum of Natural History, Howard Hughes Medical Institute |
| 49 | Environmental Studies: A Global Perspective                                    | EdX *      | Self Paced | 4 | Curtin University   |
| 50 | Introduction to Computer Science and Programming Using Python                  | edX *      | Self Paced | 4 | MIT, USA  |
| 51 | Statistics and R   | edX *      | Self Paced | 4 | Harvard University  |
| 52 | Introduction to Programming in C   | Coursera * | 4 weeks    | 4 | Duke University   |
| 53 | Java Programming: Solving Problems with Software                               | Coursera   | 4 weeks    | 4 | Duke University   |
| 54 | Grammar and Punctuation  | Coursera   | 4 weeks    | 1 | University of California  |
| 55 | How to Write an Essay  | Coursera * | 5 weeks    | 1 | University of California, Berkeley                                  |
| 56 | Conversational English Skills  | EdX *      | 10 weeks   | 3 | Tsinghua University   |
| 57 | Advanced Writing   | Coursera * | 4 weeks    | 1 | University of California, Irvine                                    |
| 58 | Speak English Professionally: In Person, Online & On the Phone                 | Coursera * | 5 weeks    | 1 | Georgia Institute of Technology                                     |
| 59 | English for Science, Technology, Engineering, and Mathematics                  | Coursera   | 5 weeks    | 1 | University of Pennsylvania  |
| 60 | English Composition  | edX        | 8 weeks    | 3 | Arizona State University  |
| 61 | Take Your English Communication Skills to the Next Level                       | Coursera * | 4 weeks    | 1 | Georgia Institute of Technology                                     |

**Guidelines regarding  
Mandatory Induction Program for  
the new students**



**Maulana Abul Kalam Azad University of Technology, West Bengal**  
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BF- 142, Sector-I, Salt Lake, Kolkata- 700064, India

Date: 06.12.2017

## Maulana Abul Kalam Azad University of Technology, West Bengal

### Guidelines regarding Induction Programme for the new students

(As per Model Curriculum for 1<sup>st</sup> Year UG degrees courses in Engineering & Technology, November 2017)

#### To be followed from the 2018-19 academic session

**Preamble:** Engineering education has evolved globally in a continuous manner to address the twin needs of industry and society. It is now an accepted fact that the institutions imparting technical education should aspire to create manpower who will possess strong technical knowledge and skill, have leadership qualities and be a team player, capable of coming up with innovative solutions and be alive to societal and community concerns.

The aim of the Induction Programme is to acclimatize the students to the environment of their engineering institution, give them a flavour of the exciting new world of education that they are entering, provide them with mentoring schemes, and make them aware of their neighbourhood, society and people. This will allow them to evolve as well rounded individuals.

The following schedule is laid down by the University to implement the three week long Induction Programme:

|                   |                      |                |  |
|-------------------|----------------------|----------------|--|
| Week 1            | 1 <sup>st</sup> Half | Day 1          | Overall introduction of the new students to the Institution, its different Departments & Faculty Members   |
|                   | 2 <sup>nd</sup> Half | Day 1          | (a) Assignment of faculty mentors to the new students<br>(b) Assessment and allotment for mentoring by senior students preferably from the second year   |
|                   | 2 hrs                | Day 2, 3, 4, 5 | Lectures by eminent personalities on different areas such as (a) Introduction to Engineering (b) Various topics of science and technology<br>(c) Innovation and entrepreneurship<br>(d) Creative and performing arts (e) Social issues |
|                   | 2 hrs.               | Day 2, 3, 4, 5 | Participation in Games, Yoga, Meditation etc.  |
|                   | 2 hrs                | Day 2, 3, 4, 5 | Visit to the different Departments of the Institute  |
| Week 2 (All Days) | 2hrs                 |                | Scheduled class lectures as per time table.  |
|                   | 2hrs                 |                | Students to be conducted through proficiency modules to be prepared by respective Colleges for ascertaining English skills & Computer knowledge of the students  |



|        |      |       |  |
|--------|------|-------|--|
|        |      |       | and to prepare a report on the same  |
|        | 2hrs |       | Participation in Games, Sports, Yoga, Creative arts etc.                                 |
| Week 3 | 2hrs |       | Scheduled class lectures as per time table   |
|        |      | Day 1 | Visits to neighbourhood locations  |
|        |      | Day 2 | Visits to natural spots in adjoining areas to understand the effect of nature on society |
|        |      | Day 3 | Visits to Science Museum / laboratories  |
|        |      | Day 4 | Visits to NGOs   |
|        |      | Day 5 |  |

Any other activity, as deemed fit by the Director/Principal of the affiliated Colleges, may be proposed and discussed with the Academic Coordinator of the University, by sending email to the following address: [academics.makaut@gmail.com](mailto:academics.makaut@gmail.com).

Note: 1) If necessary, networking may be established with NGOs to facilitate the different components and aspects of the Induction Programme.

**Mandatory Additional Requirement  
for earning B. Tech Degree**



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**Maulana Abul Kalam Azad University of Technology, West Bengal**  
**BF-142, Sector-I, Saltlake**

**Notice**

**Mandatory Additional Requirement for earning B.Tech Degree**

**Addressing the needs of the industry and the society:** Globally, engineering education systems have continuously evolved, in order to address the needs of the industry and the society. It is becoming imperative that every University should create opportunities for the students to inculcate attributes, which are not restricted only to engineering knowledge and acumen. Industry needs professionals who can work successfully in teams, who have leadership qualities, who are alive to social and community needs and who can bring innovation and creativity to their work and who are also digitally proficient. Hence, in order to prepare its students to match these multiple requirements, MAKAUT, WB has created a unique mechanism of awarding 100 Activity Points over and above the academic grades. It is planned that the students at MAKAUT, WB will be able to reap benefits from these activities at their own pace and comfort. It is expected that by the time MAKAUT, WB's students reach their Final Year, they would have developed themselves so well both through their studies in the respective technological field and through their active participation in the co-curricular and extra-curricular activities as also through SAWYAM based learning activities that they would be well-prepared for contributing to building the India and the world of their dreams.

**The additional requirement applies to:** Every student, who is admitted to the 4 years B.Tech program from the academic year 2018-19 onwards, is required to earn minimum 100 Activity Points in addition to the required academic grades, for getting MAKAUT, WB's B.Tech degree. Similarly, it is mandatory to earn 75 Activity Points, in addition to the academic grades, for getting B.Tech degree by a student (Lateral Entry) who is admitted to the B.Tech program from the academic year 2018-19 onwards. *(Please see Table 1 for details.)* [Lateral Entry students will have a multiplying factor of 1.33 to bring uniformity in score].

| <b>Level of Entry in B.Tech Course</b>   | <b>Total duration for earning Points</b> | <b>Minimum Points</b> |
|--|--|-----------------------|
| 1 <sup>st</sup> Year from the academic year 2018-19 onwards                    | 1 <sup>st</sup> to 4 <sup>th</sup> Year  | 100                   |
| 2 <sup>nd</sup> Year from the academic year 2018-19 onwards<br>(Lateral Entry) | 2 <sup>nd</sup> to 4 <sup>th</sup> Year  | 75                    |

**Table – I**

**For existing Students (except students in the 4<sup>th</sup> year):** Every student, who is admitted to the 4 years B.Tech program prior to the academic year 2018-19, is required to earn minimum number of Activity Points as per Table II in addition to the required academic grades, for getting MAKAUT, WB's B.Tech degree.

| <b>Current Semester</b> | <b>Total Points to be earned During the full course</b> |
|-------------------------|---|
| 2 <sup>nd</sup>         | 100   |
| 4 <sup>th</sup>         | 75  |
| 6 <sup>th</sup>         | 50  |

**Table –II**

These points must be earned on the basis of active participation in co-curricular and extracurricular activities spanning through all the semesters of study. Every student may choose, as per his/her liking, activities in order to achieve the mandatory points (as per Table-III, depending on his/her entry level), before becoming eligible for award of the Degree. These activities can be spread over the years, as per convenience of the student.

**Notes:**

- **Current 4<sup>th</sup> year students who are going to sit for Final Semester examination in May-June, 2018 are outside the preview of this Mandatory Additional Requirement**
- Every student shall participate in the co-curricular and extra-curricular activities and produce documentary proof to the designated Faculty Members appointed by the Head of Department / Principal / Director in the respective college. Thereby the student should earn the required Points before *her* she appears for his/ her Final Examinations.
- A student's result of his/her Final Examinations will be withheld until he/she completes the minimum Activity Points by the end of his/her B.Tech Program.
- In every semester, every student is required to prepare a file containing documentary proofs of activities, done by him / her. This file will be duly verified and Activity Points will be assigned by the teachers as appointed above, at the end of every semester.
- The college will form a 3 members committee and finalize the Activity Points for each student before entering them into the Online Point Entry System (at the URL, as specified by the COE of the University).
- Every student has to earn at least 100 activity points. The points students has earned will be reflected in the student's marksheet.
- Activity points earned by Lateral Entry students will be multiplied by 1.33.

Table III provides a List of Activity Heads and Sub-Activity Heads along with their capping of the Activity Points that can be earned by the students during the entire B.Tech duration.

| Sl. No. | Name of the Activity   | Points | Maximum Points Allowed |
|---------|--|--------|------------------------|
| 1.      | MOOCS (SWAYAM/NPTEL/Spoken Tutorial) (per course)                                  | 20     | 40                     |
| 2.      | Tech Fest/Teachers Day/Freshers Welcome  |        |                        |
|         | Organizer  | 5      | 10                     |
|         | Participants   | 3      | 6                      |
| 5.      | Rural Reporting  | 5      | 10                     |
| 6.      | Tree Plantation (per tree)   | 1      | 10                     |
| 7.      | Participation in Relief Camps  | 20     | 40                     |
| 8.      | Participation in Debate/Group Discussion/ Tech quiz                                | 10     | 20                     |
| 9.      | Publication of Wall magazine in institutional level (magazine/article/internet)    | 10     | 20                     |
| 10.     | Publication in News Paper, Magazine & Blogs  | 10     | 20                     |
| 11.     | Research Publication (per publication)   | 15     | 30                     |
| 12.     | Innovative Projects (other than course curriculum)                                 | 30     | 60                     |
| 13.     | Blood donation   | 8      | 16                     |
|         | Blood donation camp Organization   | 10     | 20                     |
| 15.     | Participation in Sports/Games  |        |                        |
|         | College level  | 5      | 10                     |
|         | University Level   | 10     | 20                     |
|         | District Level   | 12     | 24                     |
|         | State Level  | 15     | 30                     |
|         | National/International Level   | 20     | 20                     |
| 21.     | Cultural Programme (Dance, Drama, Elocution, Music etc.)                           | 10     | 20                     |
| 22.     | Member of Professional Society   | 10     | 20                     |
| 23.     | Student Chapter  | 10     | 20                     |
| 24.     | Relevant Industry Visit & Report   | 10     | 20                     |
| 25.     | Photography activities in different Club( Photography club, Cine Club, Gitisansad) | 5      | 10                     |
| 26.     | Participation in Yoga Camp (Certificate to be submitted)                           | 5      | 10                     |
| 27.     | Self-Entrepreneurship Programme  | 20     | 20                     |
| 28.     | Adventure Sports with Certification  | 10     | 20                     |
| 29.     | Training to under privileged/Physically challenged                                 | 15     | 30                     |
| 30.     | Community Service & Allied Activities  | 10     | 20                     |

Suggestions from the College Principals will be considered to append in the above Table-III.

Sd/-

Registrar(Acting)  
MAKAUT,WB

**Maulana Abul Kalam Azad University of Technology, West Bengal**  
**Record of Activities for Mandatory Additional Requirement**

Annexure-1  
Rev:00

| College Name (College Code): |  |        |                     | Department:   |      |      |                  |      |      |      |      |       |
|------------------------------|--|--------|---------------------|---------------|------|------|------------------|------|------|------|------|-------|
| Student Name:                |  |        | University Roll No: |               |      |      | Registration No: |      |      |      |      |       |
| Sl No                        | Activity   | Points | Max. Points Allowed | Points Earned |      |      |                  |      |      |      |      | Total |
|                              |  |        |                     | Sem1          | Sem2 | Sem3 | Sem4             | Sem5 | Sem6 | Sem7 | Sem8 |       |
| 1                            | <i>MOOCS (SWAYAM/NPTEL/Spoken Tutorial) per course</i>                                 |        |                     |               |      |      |                  |      |      |      |      |       |
|                              | For 12 weeks duration  | 20     | 40                  |               |      |      |                  |      |      |      |      |       |
|                              | For 8 weeks duration   | 16     |                     |               |      |      |                  |      |      |      |      |       |
| 2                            | <i>Tech Fest/Teachers Day/Freshers Welcome</i>   |        |                     |               |      |      |                  |      |      |      |      |       |
|                              | Organizer  | 5      | 10                  |               |      |      |                  |      |      |      |      |       |
|                              | Participants   | 3      | 6                   |               |      |      |                  |      |      |      |      |       |
| 3                            | Rural Reporting  | 5      | 10                  |               |      |      |                  |      |      |      |      |       |
| 4                            | Tree Plantation and up keeping (per tree)  | 1      | 10                  |               |      |      |                  |      |      |      |      |       |
| 5                            | Participation in Relief Camps  | 20     | 40                  |               |      |      |                  |      |      |      |      |       |
| 6                            | Participation in Debate/Group Discussion/ Tech quiz                                    | 10     | 20                  |               |      |      |                  |      |      |      |      |       |
| 7                            | <i>Publication of Wall magazine in institutional level (magazine/article/internet)</i> |        |                     |               |      |      |                  |      |      |      |      |       |
|                              | Editor   | 10     | 20                  |               |      |      |                  |      |      |      |      |       |
|                              | Writer   | 6      | 12                  |               |      |      |                  |      |      |      |      |       |
| 8                            | Publication in News Paper, Magazine & Blogs  | 10     | 20                  |               |      |      |                  |      |      |      |      |       |
| 9                            | Research Publication (per publication)   | 15     | 30                  |               |      |      |                  |      |      |      |      |       |
| 10                           | Innovative Projects (other than course curriculum)                                     | 30     | 60                  |               |      |      |                  |      |      |      |      |       |
| 11                           | Blood donation   | 8      | 16                  |               |      |      |                  |      |      |      |      |       |
|                              | Blood donation camp Organization   | 10     | 20                  |               |      |      |                  |      |      |      |      |       |

**Maulana Abul Kalam Azad University of Technology, West Bengal**  
**Record of Activities for Mandatory Additional Requirement**

*Annexure-I*  
Rev:00

| Sl No                      | Activity  | Points | Max. Points Allowed | Points Earned |      |      |      |      |      |      |      | Total |
|----------------------------|---|--------|---------------------|---------------|------|------|------|------|------|------|------|-------|
|                            |   |        |                     | Sem1          | Sem2 | Sem3 | Sem4 | Sem5 | Sem6 | Sem7 | Sem8 |       |
| 12                         | <i>Participation in Sports/Games</i>  |        |                     |               |      |      |      |      |      |      |      |       |
|                            | College level   | 5      | 10                  |               |      |      |      |      |      |      |      |       |
|                            | University Level  | 10     | 20                  |               |      |      |      |      |      |      |      |       |
|                            | District Level  | 12     | 24                  |               |      |      |      |      |      |      |      |       |
|                            | State Level   | 15     | 30                  |               |      |      |      |      |      |      |      |       |
|                            | National/International Level  | 20     | 20                  |               |      |      |      |      |      |      |      |       |
| 13                         | Cultural Programme (Dance, Drama, Elocution, Music etc.)                          | 10     | 20                  |               |      |      |      |      |      |      |      |       |
| 14                         | Member of Professional Society  | 10     | 20                  |               |      |      |      |      |      |      |      |       |
| 15                         | Student Chapter   | 10     | 20                  |               |      |      |      |      |      |      |      |       |
| 16                         | Relevant Industry Visit & Report  | 10     | 20                  |               |      |      |      |      |      |      |      |       |
| 17                         | Photography activities in different Club(Photography club, Cine Club, Gitisansad) | 5      | 10                  |               |      |      |      |      |      |      |      |       |
| 18                         | Participation in Yoga Camp (Certificate to be submitted)                          | 5      | 10                  |               |      |      |      |      |      |      |      |       |
| 19                         | Self-Entrepreneurship Programme   | 20     | 20                  |               |      |      |      |      |      |      |      |       |
| 20                         | Adventure Sports with Certification   | 10     | 20                  |               |      |      |      |      |      |      |      |       |
| 21                         | Training to under privileged / Differently abled                                  | 15     | 30                  |               |      |      |      |      |      |      |      |       |
| 22                         | Community Service & Allied Activities   | 10     | 20                  |               |      |      |      |      |      |      |      |       |
| <b>Total Points</b>        |   |        |                     |               |      |      |      |      |      |      |      |       |
| <b>Signature of Mentor</b> |   |        |                     |               |      |      |      |      |      |      |      |       |
| <b>Signature of HOD</b>    |   |        |                     |               |      |      |      |      |      |      |      |       |

\*Please abide strictly to the **Notes at the end of the Notice by Registrar, MAKAUT, WB** regarding **Mandatory Additional Requirement for earning B.Tech Degree**

\* *Annexure-I* is to be retained in the Institute records with all documentary proofs of activities (*to be verified by the University as and when required*).