Tripura University

(A Central University)

Curriculum

For

B. Tech. Program

(1st and 2nd Semester)

Common Syllabus for all branches

2021

Curriculum Structure (Total Credit: 162)

COMMON SYLLABUS- FIRST SEMESTER

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hours/ week	Credit	Full Marks
1.	Basic Science - 1	BS 101	Mathematics - I	3	1	0	4	4	100
2.	Basic Science - 2	BS 102	Physics	3	1	0	4	4	100
3.	Engineering Science - 1	ES 103	Basic Electrical Engineering	3	1	0	4	4	100
4.	Engineering Science - 2	ES 104	Engineering Graphics and Design	1	0	0	1	1	100
5.	Basic Science - 3	BS 105	Physics Laboratory	0	0	3	3	1.5	100
6.	Engineering Science - 3	ES 106	Engineering Graphics Practice	0	0	4	4	2	100
7.	Engineering Science - 4	ES 107	Basic Electrical Engineering Laboratory	0	0	2	2	1	100
8.	Mandatory Course - 1	MC 108	Induction Program	3 weeks in the beginning of the semester				0	100
Total :				10	3	9	22	17.5	800

COMMON SYLLABUS- SECOND SEMESTER

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hours/ week	Credit	Full Marks
1.	Humanities Science - 1	HS 201	English	2	0	0	2	2	100
2.	Basic Science - 4	BS 202	Mathematics-II	3	1	0	4	4	100
3.	Basic Science - 5	BS 203	Chemistry	3	1	0	4	4	100
4.	Engineering Science - 5	ES 204	Programming for Problem Solving	3	0	0	3	3	100
5.	Engineering Science - 6	ES 205	Manufacturing Practices	1	0	0	1	1	100
6.	Humanities Science - 2	HS 206	Language Laboratory	0	0	2	2	1	100
7.	Basic Science - 6	BS 207	Chemistry Laboratory	0	0	3	3	1.5	100
8.	Engineering Science - 7	ES 208	Programming for Problem Solving Lab	0	0	4	4	2	100
9.	Engineering Science - 8	ES 209	Workshop on Manufacturing Practices	0	0	4	4	2	100
10.	Mandatory Course - 2	MC 210	Environmental Science	3	0	0	3	0	100
Total :				15	2	13	30	20.5	1000

FIRST SEMESTER

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hours/ week	Credit	Full Marks
1.	Basic Science - 1	BS 101	Mathematics - I	3	1	0	4	4	100
2.	Basic Science - 2	BS 102	Physics	3	1	0	4	4	100
3.	Engineering Science - 1	ES 103	Basic Electrical Engineering	3	1	0	4	4	100
4.	Engineering Science - 2	ES 104	Engineering Graphics and Design	1	0	0	1	1	100
5.	Basic Science - 3	BS 105	Physics Laboratory	0	0	3	3	1.5	100
6.	Engineering Science - 3	ES 106	Engineering Graphics Practice	0	0	4	4	2	100
7.	Engineering Science - 4	ES 107	Basic Electrical Engineering Laboratory	0	0	2	2	1	100
8.	Mandatory Course - 1	MC 108	Induction Program	3 weeks in the beginning of the semester				0	100
Total :				10	3	9	22	17.5	800

Mathematics - I

Course Code	BS 101
Course Title	Mathematics - I
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	10+2 Mathematics
Course Category	Basic Science (BS)
Number of classes	48 hours

Course Outcome:-

After completion of the course, students will be able to:

CO No	CO Description	K-level
CO-1	Apply MVT and Taylor's theorem & test convergence of sequence and series of real numbers;	K3
CO-2	Apply Cayley's theorem and solve system of linear equation;	K3
CO-3	Classify and solve ordinary differential equations of 1st and 2nd order;	K3
CO-4	Evaluate Laplace transformation and inverse Laplace transformation of some standard functions.	K4

Course Content:-

Module 1: Calculus I: (14 Lectures)

Sequence & series: Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions;

Functions: Continuity – Sequential criteria, Intermediate Value theorem; Differentiability – Rolle's Theorem, Mean Value theorems, Taylor's & Maclaurin theorems with remainders; indeterminate forms and Hospital's rule;

Module 2: Linear Mathematics: (12 Lectures)

Vector space – Definition, Basis, Dimension, Linear dependence & independence;

Matrix- Inverse and rank of a matrix, rank-nullity theorem; System of linear equations – Gaussian elimination; Symmetric, skew symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

Module 3: Ordinary Differential Equation: (12 Lectures)

First order differential equations - exact, linear and Bernoulli's form, second order differential equations with constant coefficients, method of variation of parameters, general linear differential equations with constant coefficients, Euler's equations, system of differential equations.

Module 4: Laplace transformations: (10 Lectures)

Laplace transformations: Transformation of Elementary function, linear property, Shifting & Scaling theorems, Transform of derivatives, Transform of integrals, multiplication by t^n, division by t.

Inverse Laplace transformation: Convolution theorem;

Solving linear initial value problems with constant coefficients using Laplace transform.

References / Suggested Learning Resources:-

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 1965.
2. Rajnish Verma H.K. Dass, Higher Engineering Mathematics, S Chand, 2014.
3. Erwyn Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, 8th Edition, 2008.
4. Lay, David C., Linear Algebra and Its Application, Addison-Wesley, 4th Edition, 2012.
5. G. B. Thomas, Jr. and R. L. Finney, Calculus and Analytic Geometry, Pearson India, 9th Edition, 2006
6. S. L. Ross, Differential Equations, Wiley India, 3rd Edition, 2004.

Physics

Course Code	BS 102
Course Title	Physics
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	Mathematics course on differential equations and linear algebra, Introduction to Electromagnetic theory H.S(+2 stage) Physics and Mathematics
Course Category	Basic Science (BS)
Number of classes	48 hours

Course Outcome:

At the end of the course, the student will be able to,

CO Number	CO Description	K-level
CO-1	**Apply** the knowledge of basic quantum mechanics, to set up one-dimensional Schrodinger's wave equation and its application to a matter wave system.	K3
CO-2	**Analyze** the importance of free electrons in determining the properties of metals. Describe the concept of Fermi energy. Explain the concept of quantifying the scattering from a potential barrier and tunneling.	K4
CO-3	**Recognize** different phenomenon of geometric optics and describe the working of different optical instrument based on mirror and lenses.	K3
CO-4	**Describe** the basic concepts of laser physics, working of lasers, and application of lasers to science, engineering and medicine.	K3

Course Content:

Module 1: Wave nature of particles, the Schrodinger equation and mathematical Preliminaries for quantum mechanics (12 lectures)

Introduction to Quantum mechanics, Wave nature of Particles, Time-dependent and time-independent Schrodinger equation for wavefunction, Born interpretation, probability current, Expectation values, Free-particle wavefunction and wave-packets, Uncertainty principle.

Complex numbers, Linear vector spaces, inner product, operators, eigenvalue problems, Hermitian operators, Hermite polynomials, Legendre's equation, spherical harmonics.

Module 2: Introduction to solids and applications of Schrodinger equation (12 lectures)

Free electron theory of metals, Fermi level, density of states, Application to white dwarfs and neutron stars, Bloch's theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands

Solution of stationary-state Schrodinger equation for one dimensional problems– particle in a box, particle in attractive delta-function potential, square-well potential, linear harmonic oscillator. Numerical solution of stationary-state Schrodinger equation for one dimensional problems for different potentials

Scattering from a potential barrier and tunneling; related examples like alpha-decay, field-ionization and scanning tunneling microscope

Module 3: The propagation of light and geometric optics (10 lectures)

Fermat's principle of stationary time and its applications e.g. in explaining mirage effect, laws of

reflection and refraction, Light as an electromagnetic wave and Fresnel equations, reflectance and transmittance, Brewster's angle, total internal reflection, and evanescent wave. Mirrors and lenses and optical instruments based on them, transfer formula and the matrix method.

Module 4: Wave optics and LASER (14 lectures)

Huygens' principle, superposition of waves and interference of light by wave front splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer, Mach-Zehnder interferometer. Farunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power

Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne, CO2), solid-statelasers(ruby, Neodymium), dye lasers; Properties of laser beams: mono-chromaticity, coherence, directionalityand brightness, laser speckles, application of Laser in CD writing, printers, Holography, Surgery, Optical Signal Processing.

References / Suggested Learning Resources:

(i) Eisberg and Resnick, Introduction to Quantum Physics

(ii) D. J. Griffiths, Quantum mechanics

(iii) Richard Robinett, Quantum Mechanics

(iv) Ian G. Main, Oscillations and waves in physics

(v) H.J. Pain, The physics of vibrations and waves

(vi)E. Hecht, Optics

(vii)A. Ghatak, Optics

(viii)O. Svelto, Principles of Lasers

(ix) C.L Arora(2015),Refresher Course in Physics Vol II and Vol III, By S.Chand.

(x) Devraj Singh, Engg.Physics, Vol. I ,byDanpat Rai And Co.

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Basic Electrical Engineering

Course Code	ES 103
Course Title	Basic Electrical Engineering
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	10+2 Physics
Course Category	Engineering Science (ES)
Number of Classes	48

Course Outcomes:-

After completion of this course the students will be able to:

CO Number	CO Description	K-level
CO1	Apply and analyse basic DC circuits	K-4
CO2	Apply and analyse basic AC circuits	K-4
CO3	Understand the working principles of Transformers and electrical machines.	K-2
CO4	Recognize the components of power converters and low voltage electrical installations.	K-1

Course Contents:-

Module- 1: DC Circuits (8 hours)

Detailed content of the module:-

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

Module- 2: AC Circuits (8 hours)

Detailed content of the module:-

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 and Electrical Machines (16 hours)

Detailed content of the module:-

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

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- 4: Power Converters and Electrical Installations (16 hours)

Detailed content of the module:-

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

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.

References / Suggested learning Resources :-

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.

Engineering Graphics and Design

Course Code	ES 104
Course Title	Engineering Graphics and Design
Number of Credits	1 (L: 1, T: 0, P: 0)
Prerequisites	---
Course Category	Engineering Science (ES)
Number of classes	14 hours

Course Outcome:-

After completion of the course, students will be able to:

CO No	CO Description	K-level
CO-1	Select and construct appropriate drawing scales, use drawing equipment's, and understand Indian Standards of engineering drawing	K2
CO-2	Draw and explain the principles of orthographic projections, projections of points, lines, planes and regular solids.	K4
CO-3	Draw sections, sectional views and development of surfaces of right regular solids - prism, pyramid, cylinder and cone.	K4
CO-4	Sketch orthographic projections into isometric projections and vice versa.	K4

Course Content:-

Module 1: Introduction to Engineering Drawing (Contact Hour: 3Hrs.)

Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;

Module 2: Orthographic Projection (Contact Hour: 3Hrs.)

Orthographic Projections covering, Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes; Projections of Regular Solids covering, those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

Module 3: **Sections of Solids and Development of surfaces (Contact Hour: 4Hrs.)**

Sections and Sectional Views of Right Angular Solids covering, 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)

Module 4: Isometric Projections and Conversion of Isometric Views to Orthographic Views and Vice-versa.(Contact Hour: 4Hrs.)

Isometric Projections covering, 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;

References/ Suggested Learning Resources:-

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House

2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education

3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication

4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers

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Physics Laboratory

Course Code	BS105
Course Title	Physics Laboratory
Number of Credits	1.5 (L: 0, T: 0, P: 3)
Prerequisites	10+2 Physics
Course Category	Basic Science (BS)
Number of classes	30 hours

Course Outcome:

At the end of the course, the student will be able to,

CO Number	CO Description	K-level
CO-1	**Describe and** determine the Least Count and Error of different Measuring Instruments and will be able to compensate the Instrumental error. Use and adjustments of different instruments	K2
CO-2	**Evaluate** the focal length of lens by optical bench and refractive index of prism by spectrometer	K4
CO-3	**Analyze and interpret** the experimental data and to compare it with standard (expected theoretical) data.	K4
CO-4	**Distinguish** between LED and LASER source by V-I characteristics	K3
CO-5	**Describe and design (setup)** different experiment based on LASER and optics	K3

Course Content:

List of Experiments ***(Minimum 8 experiments to be performed). Use of virtual laboratory to perform few experiments may be explored if available.***

1. To determine Refractive Index of a transparent liquid using Traveling Microscope.
2. To determine combined focal length of lens combination using U-V method.
3. To determine refractive index of the material of the prism using Spectrometer.
4. To draw <i vs < ð curve for a prism, using spectrometer, and hence to determine position of minimum deviation for the same.
5. To demonstrate that light can behave as a particle and also to determine Planck's constant
6. To determine the first excitation potential of gas (Argon) by Franck-Hertz experiment.
7. To determine the particle size of lycopodium powder using semiconductor laser
8. To determine the angle of divergence of laser beam

9. To determine the velocity of ultrasonic waves in a given liquid using ultrasonic interferometer.

10. To study the characteristics of LED and LASER source.

References / Suggested Learning Resources:

1. D.Chattopadhyay, P.C. Rakshit, An Advanced Course in Practical Physics Vol I By CentralBook Agency

2. C.R.Dasgupta, Bsc Practical Physics Vol. I, by Central Publisher.

3. A TEXTBOOK OF ENGINEERING PHYSICS PRACTICAL, Dr. Rubi Das , Dr. Rajesh Kumar, University Science Press

4. Practical Physics, P. R. Sasi Kumar, Prentice Hall of India Limited (PHI)

5.A Textbook of Practical Physics Vol-I & II, Indu Prakash, Ram Krishna, A. K. Jha, Kitab Mahal Publication

6. BSc Practical Physics, C. L. Arora, S Chand and Company Limited

Engineering Graphics Practice

Course Code	ES 106
Course Title	Engineering Graphics Practice
Number of Credits	2 (L: 0, T: 0, P: 4)
Prerequisites	---
Course Category	Engineering Science (ES)
Number of classes	40 hours

Course Outcome:-

After completion of the course, students will be able to:

CO No	CO Description	K-level
CO-1	Select and construct appropriate drawing scales, use drawing equipment's, and understand Indian Standards of engineering drawing	K2
CO-2	Draw views of given object and components	K3
CO-3	Sketch orthographic projections into isometric projections and vice versa.	K4
CO-4	Apply computer aided drafting tools to create 2D engineering drawings	K4

List of Experiments *(Minimum 10 experiments to be performed).*

Sl. No.	Practical Exercises	Approx. Hrs
1	Draw regular geometric constructions and redraw the given figure.	04
2	Draw regular geometric construction and redraw the given figure.	04
3	Draw a problem on orthographic projections using first angle method of projection having plain surfaces and slanting.	04
4	Draw another problem on orthographic projections using first angle method of projection having slanting surfaces with slots.	04
5	Draw two problems on orthographic projections using first angle method of projection having cylindrical surfaces, ribs.	04
6	Draw two problems on Isometric view of simple objects having plain and slanting surface by using natural scale.	04
7	Draw some problems on Isometric projection of simple objects having cylindrical surface by using isometric scale.	04
8	Problem based Learning: Given the orthographic views of at least three objects with few missing lines, the student will try to imagine the corresponding objects, complete the views and draw these views in sketch book.	04
9	Draw basic 2D entities like: Rectangle, Rhombus, Polygon using AutoCAD (Print out should be a part of progressive assessment).	04
10	Draw basic 2D entities like: Circles, Arcs, circular using AutoCAD (Printout should be a part of progressive assessment).	04
11	Draw basic 2D entities like: Circular and rectangular array using AutoCAD (Printout should be a part of progressive assessment).	04

References/ Suggested Learning Resources:-

1.Bureau of Indian Standards. *Engineering Drawing Practice for Schools and Colleges IS: Sp-46.* BIS. Government of India, Third Reprint, October 1998; ISBN: 81-7061-091-2.

2.Bhatt, N. D. *Engineering Drawing*. Charotar Publishing House, Anand, Gujrat 2010; ISBN: 978-93- 80358-17-8.

3.Jain & Gautam, Engineering Graphics & Design, Khanna Publishing House, New Delhi (ISBN: 978- 93-86173-478)

4.Jolhe, D. A. *Engineering Drawing*. Tata McGraw Hill Edu. New Delhi, 2010; ISBN: 978-0-07-064837-1

5.Dhawan, R. K. *Engineering Drawing*. S. Chand and Company, New Delhi; ISBN: 81-219-1431-0.

6.Shah, P. J. *Engineering Drawing*. S. Chand and Company, New Delhi, 2008, ISBN:81-219-2964-4.

7.Kulkarni, D. M.; Rastogi, A. P.; Sarkar, A. K. *Engineering Graphics with AutoCAD*. PHI Learning Private Limited-New Delhi (2010); ISBN: 978-8120337831.

8.Jeyapoovan, T. *Essentials of Engineering Drawing and Graphics using AutoCAD*. Vikas Publishing House Pvt. Ltd, Noida, 2011; ISBN: 978-8125953005.

9.Autodesk. *AutoCAD User Guide*. Autodesk Press, USA, 2015.

10.Sham, Tickoo. *AutoCAD 2016 for Engineers and Designers*. Dreamtech Press; Galgotia Publication, New Delhi, 2015; ISBN 978-9351199113.

Software/Learning Websites

1.https://www.youtube.com/watch?v=TJ4jGyD-WCw

2.https://www.youtube.com/watch?v=dmt6_n7Sgcg

3.https://www.youtube.com/watch?v=_MQScnLXL0M

4.https://www.youtube.com/watch?v=3WXPanCq9LI

5.https://www.youtube.com/watch?v=fvjk7PlxAuo

6.http://www.me.umn.edu/coursesme2011/handouts/engg%20graphics.pdf

7.https://www.machinedesignonline.com

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Basic Electrical Engineering Laboratory

Course Code	ES 107
Course Title	Basic Electrical Engineering Laboratory
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Basic Electrical Engineering
Course Category	Engineering Science (ES)
Number of Classes	20

Course Outcomes:-

After completion of this course the students will be strengthened:

CO Number	CO Description	K-level
CO1	Apply Network Theorems in higher courses of Electrical Engineering.	K-3
CO2	Design residential wiring systems for their industrial applications.	K-4
CO3	Measure different electrical quantities.	K-1
CO4	Determine the losses of transformers used for power distributions.	K-3
CO5	Demonstrate different types of electrical machines.	K-2

Course Content:-

List of Experiments:

List of Experiments ***(Minimum 6 experiments to be performed). Use of virtual laboratory to perform few experiments may be explored if available.***

1. Basic safety precautions. Introduction and use of measuring instruments–voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
3. Verification of KVL, KCL of DC circuits.
4. Verification of Superposition Theorem of DC circuit using two and three voltage sources.
5. Verification of Thevenin's and Maximum Power Transfer Theorems.
6. Verification of Norton's and Compensation Theorems.
7. Measurement of electrical quantities – voltage, current, power and power factor in RL series and parallel circuit and determination of values of components of the circuit.
8. Measurement of electrical quantities – voltage, current, power and power factor in RC series and parallel circuit and determination of values of components of the circuit.
9. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
10. Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super-synchronous speed.
11. Measurement of three phase power of balanced and unbalanced loads.
12. Determination of different losses of a Single phase Transformer.

Induction Program

Course Code	MC 108
Course Title	Induction Program
Number of Credits	3 weeks in the beginning of the semester
Prerequisites	----
Course Category	Mandatory Course (MC)
Number of classes	3 Weeks

Course Outcome:-

After completion of the course, students will be able to:

CO No	CO Description	K-level
CO-1	Adapt the new environment, reduce competition and make them work for excellence	K6
CO-2	Influenced towards exploring their academic interests and activities	K5
CO-3	build relations between teachers and students	K3
CO-4	Interpret broader view of life, and build character	K3

A Guide to Induction Program

Module 1 : Introduction

(Induction Program was discussed and approved for all colleges by AICTE in March 2017. It was discussed and accepted by the Council of IITs for all IITs in August 2016. It was originally proposed by a Committee of IIT Directors and accepted at the meeting of all IIT Directors in March 2016. This guide has been prepared based on the Report of the Committee of IIT Directors and the experience gained through its pilot implementation in July 2016 as accepted by the Council of IITs. Purpose of this document is to help institutions in understanding the spirit of the accepted Induction Program and implementing it.)

Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his study. However, he must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he would understand and fulfill his responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed. There is a mad rush for engineering today, without the student etermining for himself his interests and his goals. This is a major factor in the current state of demotivation towards studies that exists among UG students. The success of gaining admission into a desired institution but failure in getting the desired branch, with peer pressure generating its own problems, leads to a peer environment that is demotivating and

corrosive. Start of hostel life without close parental supervision at the same time, further worsens it with also a poor daily routine. To come out of this situation, a multi-pronged approach is needed. One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character.

Module 2 : Induction Program

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Precious little is done by most of the institutions, except for an orientation program lasting a couple of days. We propose a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awarness, sensitivity and understanding of the self, people around them, society at large, and nature.

2.1 Physical Activity

This would involve a daily routine of physical activity with games and sports. It would start with all students coming to the field at suitable times for light physical exercise or yoga. There would also be games in the afternoon or at other suitable times according to the local climate. These would help develop team work. Each student should pick one game and learn it for three weeks. There could also be gardening or other suitably designed activity where labour yields fruits from nature.

2.2 Creative Arts

Every student would chose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it everyday for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

2.3 Universal Human Values

It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting staff in the college and department, be sensitive to others, etc. Need for character building has been underlined earlier. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It
is best taught through group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. It is essential for giving exposure, guiding thoughts, and realizing values. The teachers must come from all the departments rather than only one department like HSS or from outside of the Institute. Experiments in this direction at IIT(BHU) are noteworthy and one can learn from them. Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program. Besides drawing the attention of the student to larger issues of life, it would build relationships between teachers and students which last for their entire 4-year stay and possibly beyond.

2.4 Literary
Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

2.5 Proficiency Modules
This period can be used to overcome some critical lacunas that students might have, for example, English, computer familiarity etc. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially. We hope that problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs,
would, hopefully, become a thing of the past.

2.6 Lectures by Eminent People
This period can be utilized for lectures by eminent people, say, once a week. It would give the students exposure to people who are socially active or in public life.

2.7 Visits to Local Area
A couple of visits (Physically or virtually which is permissible depending on the situation) to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

2.8 Familiarization to Dept./Branch & Innovations
The students should be told about different method of study compared to coaching that is needed at NITs/IITs. They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilties.

Module 3 : Schedule
The activities during the Induction Program would have an Initial Phase, a Regular Phase and a Closing Phase.

3.1 Follow Up after Closure
A question comes up as to what would be the follow up program after the formal 3-week Induction Program is over? The groups which are formed should function as mentormentee network. A student should feel free to approach his faculty mentor or the student guide, when facing any kind of problem, whether academic or financial or psychological etc. (**For every 10 undergraduate first year students, there would be a senior student as a *student guide*, and for every 20 students, there would be a *faculty mentor*.**) Such a group should remain for the entire 4-5 year duration of the stay of the student. Therefore, it would be good to have groups with the students as well as teachers from the same department/discipline Here we list some important suggestions which have come up and which have been experimented with .

3.2 Follow Up after Closure – Same Semester
It is suggested that the groups meet with their faculty mentors once a month, within the semester after the 3-week Induction Program is over. This should be a scheduled meeting shown in the timetable. (The groups are of course free to meet together on their own more often, for the student groups to be invited to their faculty mentor's home for dinner or tea, nature walk, etc.)

3.3 Follow Up – Subsequent Semesters

It is extremely important that continuity be maintained in subsequent semesters. It is suggested that at the start of the subsequent semesters (upto fourth semester), three days be set aside for three full days of activities related to follow up to Induction Program. The students be shown inspiring films, do collective art work, and group discussions be conducted. Subsequently, the groups should meet at least once a month.

Module 4 : Summary

Engineering institutions were set up to generate well trained manpower in engineering with a feeling of responsibility towards oneself, one's family, and society. The incoming undergraduate students are driven by their parents and society to join engineering without understanding their own interests and talents. As a result, most students fail to link up with the goals of their own institution. The graduating student must have values as a human being, and knowledge and metaskills related to his/her profession as an engineer and as a citizen. Most students who get demotivated to study engineering or their branch, also lose interest in learning.

The *Induction Program* is designed to make the newly joined students feel comfortable, sensitize them towards exploring their academic interests and activities, reducing competition and making them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and building of character.

The *Universal Human Values* component, which acts as an anchor, develops awareness and sensitivity, feeling of equality, compassion and oneness, draw attention to society and nature, and character to follow through. It also makes them reflect on their relationship with their families and extended family in the college (with hostel staff and others). It also connects students with each other and with teachers so that they can share any difficulty they might be facing and seek help.

References:

Motivating UG Students Towards Studies, Rajeev Sangal, IITBHU Varanasi, Gautam Biswas, IIT Guwahati, Timothy Gonsalves, IIT Mandi, Pushpak Bhattacharya, IIT Patna, (Committee of IIT Directors), 31 March 2016, IIT Directors' Secretariat, IIT Delhi.

SECOND SEMESTER

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hours/ week	Credit	Full Marks
1.	Humanities Science - 1	HS 201	English	2	0	0	2	2	100
2.	Basic Science - 4	BS 202	Mathematics-II	3	1	0	4	4	100
3.	Basic Science - 5	BS 203	Chemistry	3	1	0	4	4	100
4.	Engineering Science - 5	ES 204	Programming for Problem Solving	3	0	0	3	3	100
5.	Engineering Science - 6	ES 205	Manufacturing Practices	1	0	0	1	1	100
6.	Humanities Science - 2	HS 206	Language Laboratory	0	0	2	2	1	100
7.	Basic Science - 6	BS 207	Chemistry Laboratory	0	0	3	3	1.5	100
8.	Engineering Science - 7	ES 208	Programming for Problem Solving Lab	0	0	4	4	2	100
9.	Engineering Science - 8	ES 209	Workshop on Manufacturing Practices	0	0	4	4	2	100
10.	Mandatory Course - 2	MC 210	Environmental Science	3	0	0	3	0	100
Total :				15	2	13	30	20.5	1000

ENGLISH

Course Code	HS 201
Course Title	English
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	10+2 English
Course Category	Humanities Science (HS)
Number of classes	24 hours

Course Outcome:

At the end of the course, the student will be able to -

CO Number	CO Description	K-level
CO-1	Gain an understanding of various ways of narrating life.	K2
CO-2	Apply in their professional life specific dimensions of communication skills i.e. Reading, Writing, Listening, Thinking and Speaking.	K3
CO-3	Develop an understanding of appropriate organizational formats and channels used in business communications.	K3
CO-4	Evaluate their efficacy as fluent & efficient communicators by learning the dynamics of applied English grammar.	K5

Course Content:

Module 1: Literature: Prose, Poetry and Short Story (06 hrs)

1. Modern Improvements – John Ruskin
2. In the Bazaars of Hyderabad – Sarojini Naidu
3. The Road Not Taken – Robert Frost
4. An Astrologer's Day – R.K. Narayan

Module 2: Reading & Writing Skills (06 hrs)

Process of Reading, Reading Purposes, Characteristic of Efficient Reading, Models, Strategies, Methodologies, Reading Comprehension, Improving Comprehension Skills, Reading Activities, Elements of Effective Writing, Writing Styles, Scientific & Technical Writing, Clarity in Writing. Comprehension, Précis Writing, Essay Writing.

Module 3: Listening & Speaking Skills (06 hrs)

Meaning, Process & Types of Listening, Active and Passive Listening, Barriers to Listening, Effective Listening Skills, Feedback Skills, Role of Listening in an Organization. Skills of Effective Speaking

and Components of Effective Talk. Discussion, Meeting and Telephone: Group Discussions, Conducting a Meeting, Telephonic Communication, Oral Presentation and Role of Audio/Visual Aids.

Module 4: Basic Applied Grammar and Usage (06 hrs)

Transformation of Sentences, Word Used as Different Parts of Speech, One Word Substitution, Abbreviations, Technical Terms, Foreign Expressions, Sentence: Kinds of Sentences, Simple & Complex Sentences, Interrogative, Assertive, Affirmative & Negative, Phrases, Parts of Speech: Noun, Pronouns, Adjective, Determiners, Articles, Adverbs, Prepositions, Verbs, Auxiliaries, Conjunctions, Interjections, Tenses, Active & Passive Voice, Narration, Synonyms & Antonyms, Spotting Error in Sentences, Homophones and Homonyms.

Recommended Books:

1. Phoenix: A text Book of compulsory English for Foundation Courses of BA/BSc/BCom-Orient Blackswan.
2. English for All- Nilanjana Gupta
3. Spoken English, R. K. Bansal & . J.B. Harrison Orient Longman Hyderabad.
4. A Comprehensive English Grammar, C. E.Eckersley, Orient Longman Hyderabad.
5. Cambridge Grammar of English. Ronald Carter and Michael McCarthy, Cambridge University Press, Cambridge.
6. Business Communication - Concepts, Cases & Applications. P.D.Chaturvedi & Mukesh Chaturvedi. Pearson Publications.
7. Practical English Usage. Michael Swan. Oxford University Press.
8. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi.
9. English Grammar & Composition by Wren & Martin, S.Chand & Co. Ltd., New Delhi.

Justification for Proposing this Syllabus:

This syllabus is modified considering guidelines provided by Executive committee of B.Tech syllabus upgradation committee. Considering AICTE model curriculum for B.Tech program (2018), existing English curriculum taught under Tripura University and English curriculum taught in premier institutions of engineering studies across the country, this syllabus is framed. Given the present day need of industry, this syllabus is moulded to cater to the needs of making students industry –ready.

Mathematics - II

Course Code	BS 202
Course Title	Mathematics - II
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	10+2 Mathematics
Course Category	Basic Science (BS)
Number of classes	48 hours

Course Outcome:-

After completion of the course, students will be able to:

CO No	CO Description	K-level
CO-1	Compute partial and directional derivatives, multiple integrals of multivariable functions.	K2
CO-2	Determine analyticity & power series expansion of a complex function and evaluate complex integrals, singularities and residue of a complex function;	K3
CO-3	Evaluate improper integrals using special functions;	K3
CO-4	Apply Gauss, Green's and Stoke's theorem.	K4

Course Content:-

Module 1: Multivariable Calculus (14 Lectures)

Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers;

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.

Module 2: Complex Numbers (14 Lectures)

Complex Variables: Limit, continuity, differentiability and analyticity of functions, Cauchy-Riemann equations, line integrals in complex plane, Cauchy's integral theorem, independence of path, existence of indefinite integral,

Cauchy's integral formula, derivatives of analytic functions, Taylor's series, Laurent's series, Zeros and singularities, Residue theorem, evaluation of real integrals.

Module 4: Beta, Gamma Function (10 Lectures)

Evaluation of improper integrals; Beta and Gamma functions and their properties; Bessel's differential equation and function (first and second kind), Legendre differential equation and polynomials; some applications.

Module 4: Vector Analysis (10 Lectures)

Dot, Cross & Triple product; Jacobian, Gradient, Curl, Divergence and Laplacian; Scalar and Vector fields, Irrotational and Conservative field;

Statement & Applications of Gauss-divergence theorem, Green's theorem and Stokes' theorem;

References / Suggested Learning Resources:-

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 1965.
2. Rajnish Verma & H.K. Dass, Higher Engineering Mathematics, S Chand, 2014.
3. G. B. Thomas, Jr. and R. L. Finney, Calculus and Analytic Geometry, Pearson India, 9th Edition, 2006
4. Erwyn Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, 8th Edition, 2008.
5. Dennis G. Zill, Complex Analysis, Jones & Bartlett, 2015.
6. G. B. Thomas, Jr. and R. L. Finney, Calculus and Analytic Geometry, Pearson India, 9th Edition, 2006

Chemistry

Course Code	BS 203
Course Title	Chemistry
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	H.S(+2 stage) Chemistry
Course Category	Basic Science (BS)
Number of classes	48 hours

Course Outcome:

At the end of the course, the student will be able to

CO Number	CO Description	K-level
CO-1	Conceptualize the fundamentals of molecular structure, drug and spectroscopic technique.	K3
CO-2	Understand the types of molecules, organic reactions and nanomaterials.	K4
CO-3	Analyze the various types of inorganic and organic molecules, electromagnetic radiations and nanoparticles.	K3
CO-4	Apply the uses of drugs, properties of various nano materials in the field of catalysis, medicine and energy science.	K3

Course Content:

Module 1: *Periodic properties (**12 Lectures**)*

Electronic configurations Effective nuclear charge, variations of s, p, d and f orbital energies of atoms in the periodic table, , atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, double salts, coordination compounds, ligands, coordination numbers and geometries.

Module 2*: Organic reactions and synthesis of a drug molecule (**12 lectures**)*

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings, Cannizzaro reaction, Diels-Alder reaction, Synthesis and used of drug molecule (paracetamol, aspirin).

Module 3: Spectroscopy ***(12 lectures)***

Electromagnetic spectrum and radiation Absorption law, UV-Visible spectroscopy(Theory, instrumentation), concepts of chromophore and auxochrome, IR spectroscopy(Theory, instrumentation) Theory of NMR, number of signals, Chemical shift, Application and use of IR, UV, NMR for structure determination

Module 4: Nanoscience and Technology ***(12 lectures)***
Nanomaterials - Synthesis and characterization, Fullerenes, carbon nanotubes (types, properties and uses), nanowires, graphite, grapheme, composite materials, general application of nanomaterials (nanotechnology) in medicine, catalysis, environmental technology and energy science.

References / Suggested Learning Resources:

1. Shashi Chawla ,A Text Book of Enginerring Chemistry, Dhanapat Rai Publishing Co.
2. Chemistry for Engineers, Dr. Amsika singh, Dr. S. Vairam, Dr. S. Ramesh- publishers Willey-India.
3. Engineering Chemistry,(3e), Prasanta Rath, CENGAGE Learning.
4. Engineering Chemistry, O. G. Palanna, Mc. Graw hill.
5. A text book of Engineering Chemistry, Dr. Sunita Ratan Prof. S. K. Katari & sons.
6. Engineering Chemistry, A text book of Chemistry for Engineers, Willey India.

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Programming for Problem Solving

Course Code	ES 204
Course Title	Programming for Problem Solving
Prerequisites	Basic knowledge of Mathematics.
Course Category	Engineering Science (ES)
Number of classes	38 hours
Number of credits	03(L: 3, T: 0, P: 0)

Course Outcome:

At the end of the course, the student will be able to

CO Number	CO Description	K-level
CO-1	F**ormulate** simple algorithms for arithmetic and logical problems.	K5
CO-2	T**ranslate** the algorithms to programs (in C language).	K2
CO-3	T**est and execute** the programs and correct syntax and logical errors.	K4
CO-4	I**mplement** conditional branching, iteration and recursion.	K3

COURSE CONTENT

Module 1: Introduction to Programming (10 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/ Pseudo code 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- (3 lectures)

Arithmetic expressions and precedence (2 lectures) Conditional Branching and Loops (4 lectures) Writing and evaluation of conditionals and consequent branching (3 lectures) Iteration and loops (2 lectures)

Module 2: Basic data structure and algorithm (08 lectures)

Arrays (6 lectures) Arrays (1-D, 2-D), Character arrays and Strings , 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)

Module 3: Functions, structures and pointers (08 lectures)

Function (3 lectures) Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference, Recursion (3 lectures) Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Structure (3 lectures) Structures, Defining structures and Array of Structures, Pointers (3 lectures) Idea of pointers, Defining pointers, Use of Pointers in self-referential structures

Module 4: Introduction to Python Programming (12 lectures)

Introduction to Anaconda, Installation of Anaconda, Introduction to spyder IDE (3 lectures), I/O statement in Python, understanding variables in Python, executing sequence of instructions in console (3 lectures), conditional statements, importance of syntax and indentation, introduction to working of loops in python (6 lectures), basic arithmetic operations through programming, list and arrays(6 lectures).

References / Suggested Learning Resources:

(i) Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
(ii) E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
(iii) Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
(iv) www.nptel.ac.in

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Manufacturing Practices

Course Code	ES 205
Course Title	Manufacturing Practices
Number of Credits	1 (L: 1, T: 0, P: 0)
Prerequisites	---
Course Category	Engineering Science (ES)
Number of classes	12 hours

Course Outcome:-

After completion of the course, students will be able to:

CO No	CO Description	K-level
CO-1	Demonstrate the workshop safety rules.	K2
CO-2	Identify Lathe, Drilling Machine, Shaper Machine, Planner Machine, Milling Machine and Grinding Machine.	K2
CO-3	Prepare joints like Half Lap Joint, Mortise & Tenon Joint, Single Bracket, Dovetail Joint and T-Lap joint.	K4
CO-4	Demonstrate the concept of cold & hot working process.	K3
CO-5	Differentiate welding, brazing and soldering.	K2

Course Content:-

Module 1: Introduction to Manufacturing Practices. (Contact Hour: 4Hrs.)
Introduction - Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods
Machine Shop - Study of Different types of General Purpose Machines (Lathe, Drilling Machine, Shaper Machine, Planner Machine, Milling Machine, Grinding Machine) and their operation. Safety awareness, Safety rules & Safety equipments.

Module 2: Fitting Shop: (Contact Hour: 2Hrs.)
Introduction to different types of fitting shop tools and equipments. Familiarization with metal cutting, dimensioning, marking, filing, thread cutting etc. Safety awareness, rules & equipments.

Module 3: **Carpentry Shop: (Contact Hour: 2Hrs.)**
Introduction to different types of carpentry tools and equipments. Preparation of different joints like Half Lap Joint, Mortise & Tenon Joint, Single Bracket, Dovetail Joint, T-Lap joint, etc. Safety awareness, rules & equipments.

Module 4: Smithy Shop and Welding Shop: (Contact Hour: 4Hrs.)
Smithy Shop - Introduction to different types of Smithy tools and equipments. Concept of cold & hot working process. Safety awareness, rules & equipments.

Welding Shop - Introduction to common welding instruments & equipments, Familiarization with different welding processes, Preparation of Single butt weld joint with Manual Metal Arc Welding process / Gas Welding process. Introduction to Soldering & Brazing. Safety awareness, rules & equipments.

References/ Suggested Learning Resources:-

1. Instruction sheet with sketch/drawing provided from shop – in- charge.

2. NPTEL web or video courses on related shop activities.

3. 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.

4. Kalpakjian S. and Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.

5. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.

6. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India,1998.

7. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House,

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Language Laboratory

Course Code	HS 206
Course Title	Language Laboratory
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	10+2 English
Course Category	Humanities Science (HS)
Number of classes	20 hours

Course Outcome:

At the end of the course, the student will be able to -

CO Number	CO Description	K-level
CO-1	Develop proper listening skills; articulate and enunciate speech sounds, words and sentences clearly and efficiently.	K3
CO-2	Increase confidence in their ability to read, comprehend, organize, and retain written information.	K3
CO-3	Deliver effective speeches that are consistent with and appropriate for the audience and purpose.	K3
CO-4	Choose the correct and relevant technical style of communication & presentation at their work place and become able to apply techniques for developing interpersonal communication skills and positive attitude leading to their professional competence.	K4

Course Content:

List of Activities: (Minimum 06 activities to be performed)

1. **Introduction to Phonetics**: Organs of Speech, Mechanism of Sound Production, Different Kinds of Sounds, Consonant Sounds, Place of Articulation, Manner of Articulation, Vowels Sounds, Syllable Division and Word Stress- Rules of Stress, Intonation- Pitch, Tone Shapes, Rising Tone, Falling Tone. Activity- Production of speech sounds and identifying the corresponding phonetic consonant and vowel symbols.
2. **Comprehension Skills** based on Reading and Listening. Activity- Comprehend a text on reading/listening the given text.
3. **Common Everyday Situations**: Conversations and Dialogues. Activity – Role play on given everyday situation.
4. **Speaking skills**: Fluency & Accuracy in speech- positive thinking, Improving Self expression Developing persuasive public speaking skills. Activity – Individual Speech Delivery/Extempore Speech

Delivery.

5. **Written Communication at Workplace:** Job application, Business letters, Email writing. Activity – Writing Job application/ Business letters/email using correct grammatical patterns and following principles of effective communication.
6. **Group Discussion:** Understanding group dynamics; GD strategies-activities to improve GD skills. Activity - Participating in group discussions.
7. **Interview Skills:** Interview Etiquette-dress code, body language. Activity – Attending mock job interviews.
8. **Formal Presentations:** Presentation Skills for Technical Paper/Project Reports/ Professional Reports/Appropriate topics based on proper stress and intonation mechanics. Activity – Making power point presentations on given topics.

Recommended Books:

1. Manual of Practical Communication by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
2. A Course in Phonetics and Spoken English, Sethi & Dhamija:, Prentice Hall
3. English for Technical Communication by N P Sudharshana & C Savitha Cambridge University Press, 1st edition, 2018.
4. Communication Skills A Workbook by Sanjay Kumar; PushpLata,Oxford Publication.
5. English Language Communication Skills: Lab Manual cumWorkbook by Rajesh Kumar, Cengage Learning, Ist edition, 2014.
6. Practical English Usage.Michael Swan, Oxford University Press.
7. Effective Business Communication, M. V., Rodriques Concept Publishing Company New Delhi, 1992 reprint (2000)
8. Handbook of Practical Communication Skills, Chrissie Wright. Jaico Publishing House. Mumbai

Chemistry Laboratory

Course Code	BS-207
Course Title	Chemistry Laboratory
Number of Credits	1.5 (L: 0, T: 0, P: 3)
Prerequisites	10+2 Chemistry
Course Category	Basic Science (BS)-06
Number of classes	30 hours

Course Outcome:

(COs): At the end of the course, the student will be able to

CO Number	CO Description	K-level
CO-1	Estimate the hardness and alkalinity of water, chloride content of water, etc	K4
CO-2	Measure conductance of solutions acid value and saponification of oil	K3
CO-3	Analyse a salt sample	K4
CO-4	Apply the knowledge of thin layer chromatography technique for separation of organic mixture	K4

Course Content:

List of Experiments ***(Minimum 8 experiments to be performed). Use of virtual laboratory to perform few experiments may be explored if available.***

1) Total hardness of water
2) Lattice structures and packing of sphere
3) Determination of chloride content of water
4) Determination of carbonate and non carbonate hardness of water sample
5) Determination of alkalinity of water sample
6) Thin layer chromatography
7) Determination of cell constant and conductance of solutions
8) Saponification value of oil
9) Acid value of an oil
10) Preparation of aspirin
11) Preparation of Nylon 66 polymer
12) Chemical analysis of a salt

References / Suggested Learning Resources:*1. Shashi Chawla ,A Text Book of Enginerring Chemistry, Dhanapat Rai Publishing Co.*

2. Chemistry for Engineers, Dr. Amsika singh, Dr. S. Vairam, Dr. S. Ramesh- publishers Willey-India.

3. Engineering Chemistry,(3e), Prasanta Rath, CENGAGE Learning.

4. Engineering Chemistry, O. G. Palanna, Mc. Graw hill.

5. Systematic experimental physical chemistry; S.W. Rajbhoj, Dr. T. K. Chonddhekar; Anjali pub.

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Programming for Problem Solving Lab

Course Code	ES 208
Course Title	Programming for Problem Solving Lab
Prerequisites	Theoretical knowledge of programming language
Course Category	Engineering Science (ES)
Number of classes	30 hours
Number of credits	02(L: 0, T: 0, P: 4)

Course Outcome:

At the end of the course, the student will be able to

CO Number	CO Description	K-level
CO-1	Correct syntax errors as reported by the compilers.	K3
CO-2	Identify and correct logical errors encountered at run time	K3
CO-3	Represent data in arrays, strings and structures and manipulate them through a program	K4
CO-4	Declare pointers of different types and use them in defining self referential structures.	K1

List of Experiments ***(Minimum 10 experiments to be performed). Use of virtual laboratory to perform few experiments may be explored if available.***

Lab1: Familiarization with programming environment

Lab 2: Simple computational problems using arithmetic expressions

Lab 3: Problems involving if-then-else structures

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

Lab 5: 1D Array manipulation

Lab 6: Matrix problems, String operations

Lab 7: Simple functions

Lab 8 and 9: Programming for solving Numerical methods problems

Lab 10: Recursive functions

Lab 11: Pointers and structures

Lab 12: Installation of Python IDE and familiarization with Python programming environment.

Lab13: Working with Spyder IDE or any other Python IDE.

Lab 14: Executing sequence of instructions in console

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Workshop on Manufacturing Practices

Course Code	ES 209
Course Title	Workshop on Manufacturing Practices
Number of Credits	2 (L: 0, T: 0, P: 4)
Prerequisites	---
Course Category	Engineering Science (ES)
Number of classes	40 hours

Course Outcome:-

After completion of the course, students will be able to:

CO No	CO Description	K-level
CO-1	Acquire skills in basic engineering practice to identify, select and use various marking, measuring, and holding, striking and cutting tools & equipment's and machines	K2
CO-2	Understand job drawing and complete jobs as per specifications in allotted time	K2
CO-3	Inspect the job for the desired dimensions and shape	K3
CO-4	Operate, control different machines and equipment's adopting safety practices	K4

List of Experiments ***(Minimum 10 experiments/jobs to be performed). Use of virtual laboratory to perform few experiments may be explored if available.***

Sl. No.	**Practical Exercises**	Approx. Hrs.
1	Demonstration of different fitting tools and drilling machines and power tools	04
2	Demonstration of different operations like chipping, filing, drilling, tapping, sawing, cutting etc.	04
3	One simple fitting job involving practice of chipping, filing, drilling, tapping, cutting etc	04
4	To make a pin from a mild steel rod in a lathe.	04
5	To make rectangular and v-slot in a block of cast iron or mild steel in a shaping machine.	04
6	To make rectangular and v-slot in a block of cast iron or mild steel in a milling machine.	04
7	To make a Gauge from MS plate.	04
8	Demonstration on Arc Welding, Gas Welding, MIG, MAG welding, gas cutting and rebuilding of broken parts with welding.	04
9	Demonstration of different wood working processes, like plaining, marking, chiseling, grooving, turning of wood etc.	04

Sl. No.	Practical Exercises	Approx. Hrs.
10	One simple job involving any one joint like mortise and tenon dovetail, bridle, half lap etc.	04
11	To join two thick MS plates by manual metal arc welding.	04
12	To join two thin mild steel plates or sheets by gas welding	04
13	One/ two green sand moulds to prepare, and a casting be demonstrated.	04
14	A simple job of making a square rod from a round bar or like.	04
15	Demonstration of different sheet metal operations like sheet cutting, bending, edging, end curling, lancing, soldering, brazing, and riveting.	04
16	One simple job involving sheet metal operations and soldering and riveting	04

References/ Suggested 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,

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Environmental Science

Course Code	MC 210
Course Title	Environmental Science
Number of Credits	0 (L:3 T:0 P:0)
Prerequisites	nil
Course category	MC

Course Outcomes:

After completion of this course the student will be able to:

CO number	CO Description	K-level
CO1	Explain renewable and non-renewable resources.	K2
CO2	Express about biodiversity and conservation of ecosystem.	K2
CO3	Discuss about causes of various environmental pollution and remedial measures.	K2
CO4	Explain sustainable development.	K2

Module 1: **Introduction to Environment** **9 hrs**

Introduction and Natural Resources: Multidisciplinary nature and public awareness, Renewable and nonrenewal resources and associated problems, Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources, Conservation of natural resources and human role. Ecosystems: Concept, Structure and function, Producers, composers and decomposers, Energy flow, Ecological succession, Food chains webs and ecological pyramids, Characteristics structures and functions of ecosystems such as Forest, Grassland, Desert, Aquatic ecosystems.

Module 2: Biodiversity **9 hrs**

Biodiversity and Conservation: Definition, Genetic, Species, and Ecosystem diversity, Biogeographical classification of India, Value of biodiversity at global, national, local levels, India as a mega diversity nation, Hot sports of biodiversity, Threats to biodiversity, Endangered and endemic species of India, In-situ and ex-situ conservation of biodiversity.

Module3: Environmental Pollution **9hrs**

Environmental Pollution- Definition, Causes, effects and control of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, nuclear hazards, human role in prevention of pollution, Solid waste management, Disaster management, floods, earthquake, cyclone and landslides.

Module4: Social issues and Environment **9hrs**

Social issues and Environment- Unsustainable to sustainable development, Urban problems related to energy, Water conservation and watershed management, Resettlement and rehabilitation, Ethics, Climate change, Global warming, Acid rain, Ozone layer depletion, Nuclear accidents, Waste land reclamation, Consumerism and waste products, Environment protection act, Wildlife protection act, Forest conservation act, Environmental issues in legislation, Population explosion and family welfare

program, Environment and human health, EIA, Role of information technology in environment and human health.

References:

1. Agarwal, K.C., Environmental Biology, Nidi Publication Ltd., Bikaner, 2001.
2. BharuchaErach, Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmadabad, 2002.
3. Clark, R.S., Marine Pollution, Clanderson Press, Oxford, 2002.
4. Cunningham, W.P., et al. , Environmental Encyclopedia, Jaico Publishing House, Mumbai, 2003.