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.