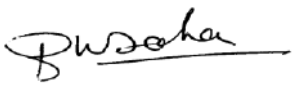
7th meeting of Syllabus Committee, will be held on 12.06.2021 at 8.00 pm, through Google meet

Agenda:

1. To transact the views regarding the Syllabus review
2. To frame the new syllabus from the new session 2021-22
3. Misc.

You are requested to kindly attend the meeting.

(P K Saha)
Co-ordinator, Syllabus Committee
Members:
1. HOD,CE
2. HOD,EE
3. HOD,ME
4. HOD,CSE
5. HOD,ECE
6. HOD,IT
7. HOD, Mathematics
8. HOD,Physics
9. HOD, Chemistry
10. HOD, Humanities
11. COE
12. ACOEs
12. Supdt. of Workshop
13. Prof. Soupayan Mitra
14. Prof. Dhiman Mondal
15. Prof. Goutam Kumar Panda
16. Prof. Chinmoy Ghosh
17. The Principal



Co-ordinator , Syllabus Committee

Minutes of the 7th meeting of Syllabus Committee held on 12.06.2021 at 8.00 pm, through Google meet in the conference room to transact the views regarding the Syllabus review and to frame the new syllabus for the students newly admitted from the session 2021-22.

Members present:

Sr. No.	Member
1	Dr. Amitava Ray, Principal
2	Dr. Goutam Bairagi, Professor & Head ,CE
3	Dr. Santanu Das, Professor & Head ,EE
4	Prof. Subrata Bhattacharya, Associate Professor & Head ,ME
5	Dr. Jishan Mehedi, Associate Professor & Head ,ECE
6	Dr. Subhas Barman, Assistant Professor, Head ,CSE & Dy. COE
7	Dr. Swapan Kumar Ray, Associate Professor & Head , Mathematics
8	Prof. Dhiman Mondal , Assistant Professor, CSE
9	Dr. Arindam Saha, Assistant Professor, Physics., HOD, Humanities
10	Dr. Niharul Alam, Assitant Professor & HOD, Chemistry
11	Dr. Nripati Chakravortty, Associate Professor & Head , Physics
12	Dr. Soupayan Mitra, Professor, ME
13	Dr. Goutam Kumar Panda, Professor & Head ,EE
14	Prof. Pradip Kumar Saha, Professor,EE & Co-ordinator, Syllabus Committee

Minutes:

1. The Principal, Dr. Amitava Ray, welcomed all the members and ordered to initiate the meeting.
2. The Principal explained the requirements to review the on-going syllabus, which was implemented from the entry batch of 2018-19.

Proceedings: Brain storming discussion held for a long time and agreed for reviewing the present syllabus. After reviewing:

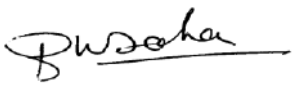
- **i.** A common structure of four years (8th semesters) for all the departments of the college is drafted.
- **ii.** A common structure of first year (first & second semesters) with detailed syllabus for all the departments of the college is drafted

Resolutions:

- **i.** It is resolved that the above **drafted common structure of four years (8th semesters) of the syllabus for all the departments** will be circulated to all the departments / sections for detailed study and views of the department should reach to the syllabus committee by 13th , July,2021. Syllabus committee will frame a modified (if required) Common Structure for all the departments. The **drafted common structure of four years (8th semesters) of the syllabus for all the departments** or **modified drafted common structure of four years (8th semesters) of the syllabus for all the departments** will be circulated again to all the departments / sections for further detailed study for incorporating the subject names to the respective required place. After getting the filled up departmental structure from each department, the syllabus committee will frame the structure for four years (eight semesters) of departmental syllabus and will be placed to the Academic Council for approval. Detailed syllabus will be drafted afterwards.

ii. However, **the common structure for all the departments with the drafted detailed syllabus for the first year** (i.e. First semester & Second semester) syllabus is accepted unanimously. The **accepted drafted common structure of the syllabus for all the departments with the drafted detailed syllabus for the first year** will be circulated to the all the departments and sections. The drafted **detailed syllabus** may reviewed by the respective departments / section and the modified detailed syllabus may be sent to the syllabus committee by 25.06.2021 for final draft of **common structure of the syllabus for all the departments with the detailed syllabus for the first year, which will be placed to the Academic Council for approval.**

iii. The modified syllabus may be implemented from the newly admitted / entry batch of 2021-22.



Co-ordinator , Syllabus Committee

AICTE Guidelines:

Model Curriculum for First Year Undergraduate Degree Courses in Engineering & Technology

Chapter -1
General, Course structure & Theme & Semester-wise credit distribution

A. Definition of Credit:-

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credits
2 Hours Practical(Lab)/week	1 credit

B. Range of credits –

A range of credits from 150 to 160 for a student to be eligible to get Under Graduate degree in Engineering. A student will be eligible to get Under Graduate degree with Honours or additional Minor Engineering, if he/she completes an additional 20 credits. These could be acquired through MOOCs.

C. Structure of Undergraduate Engineering program:-

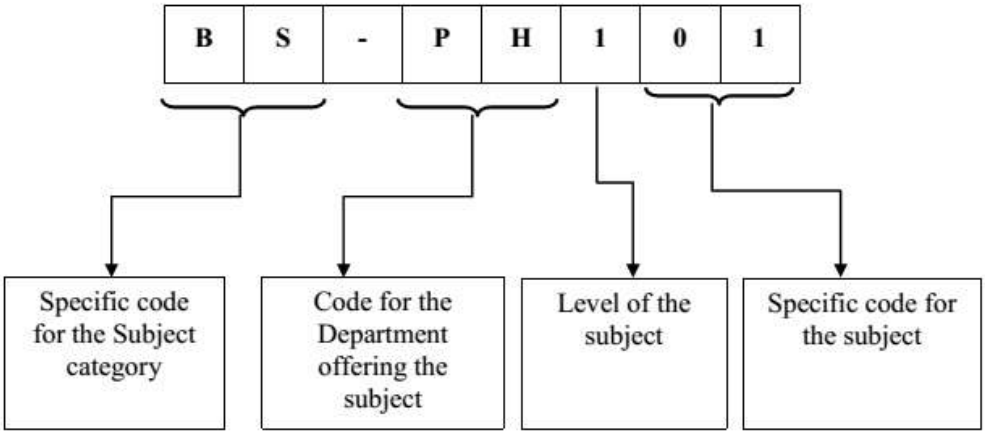
S. No.	Category	Suggested Breakup of Credits(Total 160)
1	Humanities and Social Sciences including Management courses	12*
2	Basic Science courses	25*
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc	24*
4	Professional core courses	48*
5	Professional Elective courses relevant to chosen specialization/branch	18*
6	Open subjects – Electives from other technical and /or emerging subjects	18*
7	Project work, seminar and internship in industry or elsewhere	15*
8	Mandatory Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge]	(non-credit)
	Total	160*

**Minor variation is allowed as per need of the respective disciplines.*

AICTE Guidelines:

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

G. Subject Numbering Scheme:



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

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

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE

JALPAIGURI- 735 102

(AN AUTONOMOUS GOVERNMENT COLLEGE)

DRAFTED COMMON COURSE STRUCTURE FOR B.TECH. IN CE/EE/ME/CSE/ECE/IT

(Implemented from the Academic Year 2021-22 -for the new batch only)

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Phone: 03561 – 255131 (Principal), Fax: 03561 – 256143
255465 (EPABX)- 105(EE)

FOR CE/EE/ME: Proposed draft model CC: Course Code, SC: Subject Code. Cr.: Credit, L-T-P-T: Lecture-Tutorial-Practical-Total

CC	SC	Subject Name	Contact Hrs./ Week		CC	SC	Subject name	Contact Hrs. /Week	
			L –T-P-TO	Cr.				L –T-P-TO	Cr.
BSC	BS-PH101	Physics – 1	3-1-0-4	4	BSC	BS-M201B	Mathematics-II	3-1-0-4	4
BSC	BS-M101B	Mathematics-1	3-1-0-4	4	BSC	BS-CH201	Chemistry	3-1-0-4	4
ESC	ES-CS101	Programming for Problem Solving	3-0-0-3	3	ESC	ES-EE201	Basic Electrical Engineering	3-1-0-4	4
ESC	ES-CS191	Programming for Problem Solving Lab.	0-0-4-4	2	HUM	HM-HU201	English	2-0-0-2	2
BSC	BS-PH191	Physics-I Lab.	0-0-3-3	1.5	ESC	ME-291	Engineering Graphics & Design	1-0-4-5	3
ES	ES-ME192	Workshop/Manufacturing Practice	1-0-4-5	3	ESC	EE-291	Basic Electrical Engineering Lab.	0-0-2-2	1
MAN	MAN181	Induction Program as per list	3 wks	0	BSC	CH-291	Chemistry Lab.	0-0-3-3	1.5
					HUM	HM-HU291	Language Laboratory	0-0-2-2	1
					MC	MC-201	Constitution of India	3-0-0-3	0
			10-2-11-23	17.5				15-3-11-29	20.5
BSC	M-301	Mathematics – III	3-1-0-4	4	HUM	HU-401	Value & Ethics in Profession	2-0-0-2	2
BSC	CH-301	Biology	2-0-0-2	2	ESC	-401/402	As per requirement of the department	3-1-0-4	4
ESC	ME-301	Engineering Mechanics	3-0-0-3	3	ESC	-402/402	As per requirement of the department	3-0-0-3	3
PCC	DE-301	Core compulsory-I	3-0-0-3	3	PCC	DE-401	Core compulsory-IV	3-0-0-3	3
PCC	DE-302	Core compulsory-II	3-0-0-3	3	PCC	DE-402	Core Compulsory-V	3-0-0-3	3
PCC	**DE-303**	Core compulsory-III	3-0-0-3	3	PCC	DE-403	Core compulsory-VI	3-0-0-3	3
PCC	DE-391	Departmental Lab. -I	0-0-6-6	3	**PCC**	**DE-491**	Departmental Lab. -II	0-0-6-6	3
MC	MC-301	Environmental Science	3-0-0-3	0	MC	MC-401	Essence of Traditional Knowledge	3-0-0-3	0
			20-1-6-24	21				20-1-6-24	21
HUM	HU– 501	Principles of Management	2-0-0-2	2	PCC	DE-601	Core compulsory-X	3-0-0-3	3
PCC	DE-501	Core compulsory-VII	3-1-0-4	4	**PCC**	**DE-602**	Core compulsory-XI	3-0-0-3	3
PCC	**DE-502**	Core compulsory-VIII	3-0-0-3	3	**PCC**	**DE-603**	Core compulsory-XI	3-0-0-3	3
PCC	DE-503	Core compulsory-IX	3-0-0-3	3	PEC	DE-604	Professional Elective-III	3-0-0-3	3
PEC	**DE-504**	Professional Elective-I	3-0-0-3	3	PEC	DE-605	Professional Elective-IV	3-0-0-3	3
PEC	**DE-505**	Professional Elective-II	3-0-0-3	3	OEC	OE-601	Open Elective-1	3-0-0-3	3
PCC	**DE-591**	Departmental Lab. -III	0-0-6-6	3	PCC	DE-691	Departmental Lab. -IV	0-0-4-4	2
					Proj	DE-681	Design /Project	0-0-2-2	1
			17—1-6-24	21				18-0-6-24	21
HUM	HU-701	Financial Management and Accounts	3-0-0-3	3	PEC	DE-801	Professional Elective-VI	3-0-0-3	3
PCC	**DE-701**	Core compulsory-XII	3-0-0-3	3	OEC	OE-801	Open Elective-IV	3-0-0-3	3
PEC	**DE-702**	Professional Elective-V	3-0-0-3	3	OEC	OE-802	Open Elective-V	3-0-0-3	3
OEC	**OE-701**	Open Elective-II	3-0-0-3	3	**Proj**	DE-881	Project	0-0-12-12	6
OEC	**OE-702**	Open Elective-III	3-0-0-3	3	Proj	DE-882	Viva	-----	2
PCC	DE-791	Departmental Lab. -V	0-0-4-4	2	**Proj**	**DE-883**	Internship Evaluation(all three)	0-0-0-0	0
Proj	**DE-781**	Project	0-0-8-8	4					
			15—0-12-27	21				9-0-12-21	17

Total Credits: 160

Mandatory Induction Program: 3 weeks duration:

- Physical activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./Branch & Innovations

Departmental Lab.: 6+6+6+4+4 : Department will schedule internally as per requirements of the department every semester / year ,

Core compulsory: Twelve (12) subjects Professional Electives: Six(06) subjects Open Electives: Five (05) Subjects

FOR ECE/CSE/IT: Proposed draft model CC: Course Code, SC: Subject Code. Cr.: Credit, L-T-P-T: Lecture-Tutorial-Practical-Total

CC	SC	Subject Name	Contact Hrs./ Week		CC	SC	Subject name	Contact Hrs./ Week	
			L –T-P-TO	Cr.				L –T-P-TO	Cr.
BSC	BS-CH201	Chemistry	3-1-0-4	4	BSC	BS-PH101	Physics – 1	3-1-0-4	4
BSC	BS-M101A BS-M101B	Mathematics-1 for CSE/IT Mathematics-I for ECE	3-1-0-4 3-1-0-4	4 4	BSC	BS-M201A BS-M201B	Mathematics-II for CSE/IT Mathematics-II for ECE	3-1-0-4 3-1-0-4	4 4
ESC	ES-ES101	Basic Electrical Engineering	3-1-0-4	4	HUM	HM-HU101	English	2-0-0-2	2
BSC	BS-CH291	Chemistry Lab.	0-0-3-3	1.5	ESC	ES-CS101	Programming for Problem Solving	3-0-0-3	3
ESC	ES-EE291	Basic Electrical Engineering Lab.	0-0-2-2	1	ESC	ES-ME292	Workshop/Manufacturing Practice -II	1-0-4-5	3
ESC	ES-ME191	Engineering Graphics & Design	1-0-4-5	3	ESC	ES-CS191	Programming for Problem Solving Lab.	0-0-4-4	2
MAN	MAN181	Induction Program as per list	3 wks	0	BSC	BS-PH191	Physics-I Lab.	0-0-3-3	1.5
					HUM	HM-HU191	Language Laboratory	0-0-2-2	1
					MC	MC-201	Constitution of India	3-0-0-3	0
			10-3 -9-22	17.5				15-2 -13-30	20.5
HUM	HU-401	Value & Ethics in Profession	2-0-0-2	2	BSC	M-301	Mathematics – III	3-1-0-4	4
ESC	-401	As per requirement of the department	3-1-0-4	4	BSC	CH-301	Biology	2-0-0-2	2
ESC	-402	As per requirement of the department	3-0-0-3	3	ESC	ME-301	Engineering Mechanics	3-0-0-3	3
PCC	DE-301	Core compulsory-I	3-0-0-3	3	PCC	DE-401	Core compulsory-IV	3-0-0-3	3
PCC	DE-302	Core compulsory-II	3-0-0-3	3	PCC	DE-402	Core Compulsory-V	3-0-0-3	3
PCC	**DE-303**	Core compulsory-III	3-0-0-3	3	PCC	DE-403	Core compulsory-VI	3-0-0-3	3
PCC	DE-391	Departmental Lab. -I	0-0-6-6	3	**PCC**	**DE-491**	Departmental Lab. -II	0-0-6-6	3
MC	MC-301	Essence of Traditional Knowledge	3-0-0-3	0	MC	MC-401	Environmental Science	3-0-0-3	0
			20-1 -6-27	21				20-1 -6-27	21
PCC	DE-501	Core compulsory-VII	3-0-0-3	3	HUM	HU– 601	Principles of Management	2-0-0-2	2
PCC	**DE-502**	Core compulsory-VIII	3-0-0-3	3	PCC	DE-601	Core compulsory-X	3-1-0-4	4
PCC	DE-503	Core compulsory-IX	3-0-0-3	3	**PCC**	**DE-602**	Core compulsory-XI	3-0-0-3	3
PEC	**DE-504**	Professional Elective-I	3-0-0-3	3	**PCC**	**DE-603**	Core compulsory-XI	3-0-0-3	3
PEC	**DE-505**	Professional Elective-II	3-0-0-3	3	PEC	DE-605	Professional Elective-IV	3-0-0-3	3
PEC	DE-506	Professional Elective-III	3-0-0-3	3	OEC	OE-601	Open Elective-1	3-0-0-3	3
PCC	**DE-591**	Departmental Lab. -III	0-0-6-6	3	PCC	DE-691	Departmental Lab. -IV	0-0-4-4	2
					Proj	DE-681	Design /Project	0-0-2-2	1
			18—o -6-24	21				17-1 -6-24	21
PCC	**DE-701**	Core compulsory-XII	3-0-0-3	3	HUM	HU-701	Financial Management and Accounts	3-0-0-3	3
PEC	**DE-702**	Professional Elective-V	3-0-0-3	3	PEC	DE-801	Professional Elective-VI	3-0-0-3	3
OEC	**OE-701**	Open Elective-II	3-0-0-3	3	OEC	OE-802	Open Elective-V	3-0-0-3	3
OEC	**OE-702**	Open Elective-III	3-0-0-3	3	**Proj**	DE-881	Project	0-0-12-12	6
OEC	OE-703	Open Elective-IV	3-0-0-3	3	Proj	DE-882	Viva	-----	2
PCC	DE-791	Departmental Lab. -V	0-0-4-4	2	**Proj**	**DE-883**	Internship Evaluation(all three)	0-0-0-0	0
Proj	**DE-781**	Project	0-0-8-8	4					
			15—0 -12-27	21				9-0 -12-21	17

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JALPAIGURI GOVERNMENT ENGINEERING COLLEGE

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DRAFTED
COURSE STRUCTURE AND SYLLABUS
FOR FIRST YEAR
B.TECH. IN CE/EE/ME/CSE/ECE/IT

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255465 (EPABX)-

First Semester:				
MC181: Mandatory Induction Program- 3 weeks duration				
CC	SC	Subject Name	Contact Hrs./Week	
			L –T-P-TO	Cr.
Theory				
BSC	BS-PH101	Physics -I for CE/EE/ME	3-1-0-4	4
	BS-CH101	Chemistry – I for CSE/ECE/IT	3-1-0-4	4
BSC	BS-M101A	Mathematics-I for CSE/IT	3-1-0-4	4
	BS-M101B	Mathematics-I for CE/EE/ME/ECE	3-1-0-4	4
ESC	ES-CS101	Programming for Problem Solving for CE/EE/ME	3-0-0-3	4
	ES-EE101	Basic Electrical Engineering for CSE/ECE/IT	3-1-0-4	3
Practical				
BSC	BS-PH191	Physics-I Laboratory for CE/EE/ME	0-0-3-3	1.5
	BS-CH191	Chemistry-I Laboratory for CSE/ECE/IT	0-0-3-3	1.5
ESC	ES-CS191	Programming for Problem Solving Laboratory for CE/EE/ME	0-0-4-4	2
	ES-EE191	Basic Electrical Engineering Laboratory for CSE/ECE/IT	0-0-2-2	1
ESC	ES-ME192	Workshop/Manufacturing Practice for CE/EE/ME	1-0-4-5	3
	ES-ME191	Engineering Graphics & Design for CSE/ECE/IT	1-0-4-5	3
Total : CE/EE/ME			10-2-11-23	17.5
CSE/ECE/IT			10-3-09-22	17.5

Second Semester:				
CC	SC	Subject Name	Contact Hrs./Week	
			L –T-P-TO	Cr.
Theory				
BSC	BS-CH201	Chemistry-I for CE/EE/ME	3-1-0-4	4
	BS-PH201	Physics – I for CSE/ECE/IT	3-1-0-4	4
BSC	BS-M201A	Mathematics-I for CSE/IT	3-1-0-4	4
	BS-M201B	Mathematics-I for CE/EE/ME/ECE	3-1-0-4	4
ESC	ES-EE201	Basic Electrical Engineering for CE/EE/ME	3-1-0-4	4
	ES-CS201	Programming for Problem Solving for CSE/ECE/IT	3-0-0-3	3
HUM	HM-HU201	English for CE/EE/ME/CSE/ECE/IT	2-0-0-2	2
MC	MC-201	Constitution of India	3-0-0-3	0
Practical				
BSC	BS-CH201	Chemistry-I Laboratory for CE/EE/ME	0-0-3-3	1.5
	BS-PH291	Physics-I Laboratory for CSE/ECE/IT	0-0-3-3	1.5
ESC	ES-EE191	Basic Electrical Engineering Laboratory for CE/EE/ME	0-0-2-2	1
	ES-CS191	Programming for Problem Solving Laboratory for CSE/ECE/IT	0-0-4-4	2
ESC	ES-ME191	Engineering Graphics & Design for CE/EE/ME	1-0-4-5	3
	ES-ME292	Workshop/Manufacturing Practice for CSE/ECE/IT	1-0-4-5	3
HUM	HM-HU291	Language Laboratory for CE/EE/ME/CSE/ECE/IT	0-0-2-2	1
Total : CE/EE/ME			15-3-11-29	20.5
CSE/ECE/IT			15-2-13-30	20.5

First Semester

BS-PH101/BS-PH201 :Physics-I: 3-1-0 -4: 4

1. Mechanics (7L):

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

2. Optics (5L):

Distinction between interference and diffraction, Fraunhofer and Fresnel diffraction, Fraunhofer diffraction at single slit, double slit, and multiple slits (only the expressions for max;min, & intensity and qualitative discussion of fringes); diffraction grating(resolution formulae only), characteristics of diffraction grating and its applications. Polarisation : Introduction, polarisation by reflection, polarisation by double reflection, scattering of light, circular and elliptical polarisation, optical activity.

Lasers : Principles and working of laser : population inversion, pumping, various modes, threshold population inversion with examples .

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

permeability and dielectric constant, polar and non-polar dielectrics, internal fields in a solid, Clausius- Mossotti equation(expression only), applications of dielectrics.

Magnetisation , permeability and susceptibility, classification of magnetic materials, ferromagnetism, magnetic domains and hysteresis, applications.

4. Quantum Mechanics (16 L):

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

5. Statistical Mechanics: (8L)

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

Learning Resources:

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

BS-PH191/BS-PH291: Physics-I Laboratory.: 0-0-3-3:1.5

Experiments in Optics:

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

Electricity & Magnetism experiments

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

Experiments in Quantum Physics.

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

Miscellaneous experiments.

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

BS-CH101/ BS-CH201 :Chemistry: 3-1-0 -4: 4

i) Atomic and molecular structure (10 lectures):

Schrodinger equation. Particle in a box solutions and their applications for simple sample. Molecular orbitals of diatomic molecules (e.g.H2). Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

ii) Spectroscopic techniques and applications (8 lectures):

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

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

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

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

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

v) Periodic properties (4 Lectures):
Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries:

vi)Stereochemistry ***(4 lectures):***
Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

vii) Organic ***reactions and synthesis of a drug molecule (4 lectures)***
Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization andring openings. Synthesis of a commonly used drug molecule.

Learning Resources:
1. University chemistry, by B. H. Mahan.
2. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane.
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell.
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan.
5. Physical Chemistry, by P. W. Atkins.
6. Spectroscopy of Organic Compounds, by P.S.Kalsi, New Age International Pvt Ltd Publishers.
7. Physical Chemistry, P. C. Rakshit, Sarat Book House.
8. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition.
http://bcs.whfreeman.com/vollhardtschore5e/default.asp

BS-CH191/BS-CH291: Chemistry Laboratory:0-0-3-3:1.5

Choose 10 experiments from the following:

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

BS-M101: Mathematics-IB: 3-1-0-4:4 (for CE/EE/ME/ECE)

1. ***Calculus (Integration):***Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.8
2. ***Calculus (Differentiation):***Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin's theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.6
3. ***Sequence and Series:*** Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.11
4. ***Multivariate Calculus:*** Limit, continuity and partial derivatives, Directional derivatives, Total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, Curl and Divergence.9
5. ***Matrices:*** Inverse and rank of a matrix, Rank-nullity theorem; System of linear equations; Symmetric, Skew-symmetric and Orthogonal matrices; Determinants; Eigenvalues and Eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

Learning Resources:

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

BS-M101: Mathematics-IA: 3-1-0-4:4 (for CSE/IT)

1. ***Calculus (Integration):***Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.8
2. ***Calculus (Differentiation):***Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin's theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.6
3. ***Matrices:*** Matrices, Vectors: addition and scalar multiplication, matrix multiplication; Linear systems of equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss-Jordanelimination.7
4. ***Vector Spaces:*** Vector Space, linear dependence of vectors, Basis, Dimension; Linear transformations (maps), Range and Kernel of a linear map, Rank and Nullity,Inverse of a linear transformation, Rank-Nullity theorem, composition of linear maps, Matrix associated with a linear map.9
5. ***Vector Spaces (Continued):***Eigenvalues, Eigenvectors, Symmetric, Skew-symmetric, and Orthogonal Matrices, Eigenbases. Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.10

Learning Resources:

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

ES-EE101/ ES-EE201: Basic Electrical Engineering: 3-1-0-4:4

Module 1: DC Circuits (8 hours): Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

Module 2: AC Circuits (8 hours): Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

Module 3: Transformers (6 hours): Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module 4: Electrical Machines (8 hours): Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

Module 5: Power Converters (6 hours): DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.

Module 6: Electrical Installations (6 hours): Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Learning Recourses:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

ES-EE191 /ES-EE291: Basic Electrical Engineering Lab.:0-0-2-2:1

Choose 10 experiments from the following:

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

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

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

ES-CS101/ES-CS201: Programming for Problem Solving:3-0-0-3:3

Unit 1: 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- (2 lectures)

Unit 2: Arithmetic expressions and precedence (2 lectures)

Conditional Branching and Loops (6 lectures)

Writing and evaluation of conditionals and consequent branching (3 lectures)

Iteration and loops (3 lectures)

Unit 3: Arrays (6 lectures):

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

Unit 4: Basic Algorithms (6 lectures):

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

Unit 5: Function (5 lectures):

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

Unit 6: Recursion (4 -5 lectures)

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

Unit 7: Structure (4 lectures)

Structures, Defining structures and Array of Structures

Unit 8: Pointers (2 lectures)

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

Unit 9: File handling (only if time is available, otherwise should be done as part of the lab)

Suggested Text Books:

(i) Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill, (ii) E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill Suggested Reference Books

(i) Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PrenticeHall of India

ES-CS191/ES-CS291:Programming for Problem Solving Laboratory:0-0-4-4:2

Tutorial 1: Problem solving using computers:

Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:

Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:

Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:

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

Tutorial 5: 1D Arrays: searching, sorting:

Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings

Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:

Lab 7: Simple functions

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

Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls

Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation

Lab 11: Pointers and structures

Tutorial 12: File handling: Lab 12: File operations

ES-ME191/ES-ME291:Engineering Graphics & Design:1-0-4-5:3

1. **INTRODUCTION TO ENGINEERING DRAWING:** Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Different types of lines and their use; Drawing standards and codes. 1T+4P
2. **LETTERING, DIMENSIONING, SCALES:** Plain scale, Diagonal scale and Vernier Scales. 1T+4P
3. **GEOMETRICAL CONSTRUCTION AND CURVES:** Construction of polygons, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid, Involute, Arch-median Spiral. 1T+ 4P
4. **PROJECTION OF POINTS, LINES, SURFACES:** Principles of Orthographic Projections- conventions - 1st and 3rd angle projection, Projections of Points and lines inclined to both planes; Projections of planes (Rectangle, pentagon, Hexagon etc.) inclined Planes- Auxiliary Planes. 1T+ 4P
5. **PROJECTION OF REGULAR SOLIDS:** Regular solids inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale (Cube, Pyramid, Prism, Cylinder, Cone). 1T+4P
6. **COMBINATION OF REGULAR SOLIDS, FLOOR PLANS:** Regular solids in mutual contact with each other like Spheres in contact with cones standing on their base. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. 1T+4P
7. **ISOMETRIC PROJECTIONS:** 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; 1T+4P
8. **SECTIONS AND SECTIONAL VIEWS OF RIGHT ANGULARSOLIDS:** 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) 1T+4P
9. **OVERVIEW OF COMPUTER GRAPHICS**, C**USTOMISATION&CAD DRAWING:** listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerance; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles; 1T+4P
10. **ANNOTATIONS, LAYERING & OTHER FUNCTIONS:** applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling; 2T+8P
11. **DEMONSTRATION OF A SIMPLE TEAM DESIGN PROJECT:** Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid modeling software for creating

associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modeling (BIM).

General Instructions:

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

1. Drawing Board
2. Mini drafter/ Set-squares (45°–45° & 60°–90°), T-square
3. Protractor (180°, 360°)
4. Scales (Plain, Diagonal)
5. Compass (Small and Large)
6. Divider (Small and Large)
7. French Curves
8. Drawing paper (A1 Size)
9. Drawing pencil (H, HB, B)
10. Sharpener
11. Eraser
12. Drawing pins & clips
13. Duster or handkerchief etc.

Learning Resources:

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

ES-ME192/ES-ME292:1-0-4-5:3 Workshop/ Manufacturing Practices

(i) Lectures & videos:

Detailed contents:

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

(ii) Workshop Practice:

Machine shop (8 hours) *Typical jobs that may be made in this practice module:*

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

Fitting shop (8 hours)*Typical jobs that may be made in this practice module:*

- To make a Gauge from MS plate.

Carpentry (8 hours)*Typical jobs that may be made in this practice module:*

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

Welding shop (8 hours (Arc welding 4 hrs + gas welding 4 hrs))*Typical jobs that may be made in this practice module:*

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

Casting (8 hours)*Typical jobs that may be made in this practice module:*

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

Smithy (4 hours): *Typical jobs that may be made in this practice module:*

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

Plastic moulding& Glass cutting (4 hours) *Typical jobs that may be made in this practice module:*

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

Electrical & Electronics (8 hours)

Familiarization with LT switchgear elements, making its sketches and noting down its specification. Kitkat fuse, Glass cartridge fuse, Plastic fuse holders (optional), Iron clad isolators, MCB style isolators, Single phase MCB, Single-phase wire, wiring cable.

Demonstration of domestic wiring involving two MCB, two piano key switches, one incandescent lamp, one LED lamp and plug point.

Simple wiring exercise to be executed to understand the basic electrical circuit.

Simple soldering exercises to be executed to understand the basic process of soldering.

Fabrication of a single-phase full wave rectifier with a step down transformer using four diodes and electrolytic capacitor and to find its volt-ampere characteristics to understand basic electronic circuit fabrication.

Learning Resources:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. and Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.
4. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
5. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

Second Semester

BS-M201: Mathematics-IIA:3-1-0-4:4 (CSE/IT)

1. **Basic Probability:** Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the Multinomial distribution, Poisson approximation to the Binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality. 11
2. **Continuous Probability Distributions:** Continuous random variables and their properties, Distribution functions and densities, Normal, Exponential and Gamma densities. 4
3. **Bivariate Distributions:** Bivariate distributions and their properties, distribution of sums and quotients, Conditional densities, Bayes' rule. 5
4. **Basic Statistics:** Measures of Central tendency, Moments, Skewness and Kurtosis, Probability distributions: Binomial, Poisson and Normal and evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation. 8

5. **Applied Statistics:** Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations. 8
6. **Small samples:** Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes. 4

Learning Resources:

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

BS-M202:Mathematics-IIB: 3-1-0-4:4 (CE/EE/ME/ECE)

1. ***Multivariate Calculus (Integration):***Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, change of variables (Cartesian to Polar), Applications: Areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), Orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes. 11
2. ***First order ordinary differential equations:*** Exact, linear and Bernoulli's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type. 5
3. ***Ordinary differential equations of higher orders:*** Second order linear differential equations with constant coefficients, Use of D operators, Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties. 9
4. ***Complex Variable – Differentiation:*** Differentiation of complex functions, Cauchy-Riemann equations, Analytic functions, Harmonic functions, determination of harmonic conjugate, elementary analytic functions (exponential, trigonometric, logarithmic) and their properties; Conformal mappings, Mobius transformations and their properties. 6
5. ***Complex Variable – Integration:*** Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem(without proof); Taylor's series, Zeros of analytic functions, Singularities, Laurent's series; Residues, Cauchy residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour. 9

Learning Resources:

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

HM-HU201: English : 2-0-0-2:2

1. Vocabulary Building
1.1 The concept of Word Formation
1.2 Root words from foreign languages and their use in English
1.3 Acquaintance with prefixes and suffixes from foreign languages in English to formderivatives.
1.4 Synonyms, antonyms, and standard abbreviations.
2. Basic Writing Skills

2.1 Sentence Structures
2.2 Use of phrases and clauses in sentences
2.3 Importance of proper punctuation
2.4 Creating coherence
2.5 Organizing principles of paragraphs in documents
2.6 Techniques for writing precisely
3. Identifying Common Errors in Writing
3.1 Subject-verb agreement
3.2 Noun-pronoun agreement
3.3 Misplaced modifiers
3.4 Articles
3.5 Prepositions
3.6 Redundancies
3.7 Clichés
4. Nature and Style of sensible Writing
4.1 Describing
4.2 Defining
4.3 Classifying
4.4 Providing examples or evidence
4.5 Writing introduction and conclusion
5. Writing Practices
5.1 Comprehension
5.2 Précis Writing
5.3 Essay Writing
6. Oral Communication
(This unit involves interactive practice sessions in Language Lab)
6.1 Listening Comprehension
6.2 Pronunciation, Intonation, Stress and Rhythm
6.3 Common Everyday Situations: Conversations and Dialogues
6.4 Communication at Workplace
6.5 Interviews
6.6 Formal Presentations
Suggested Readings:
(i) *Practical English Usage.* Michael Swan. OUP. 1995.
(ii) *Remedial English Grammar.* F.T. Wood. Macmillan.2007
(iii)*On Writing Well.*William Zinsser. Harper Resource Book. 2001
(iv) *Study Writing.* Liz Hamp-Lyons and Ben Heasly.Cambridge University Press. 2006.
(v) *Communication Skills*. Sanjay Kumar and PushpLata.Oxford University Press. 2011.
(vi) *Exercises in Spoken English.* Parts.I-III. CIEFL, Hyderabad. Oxford University Press

HM-HU291:Language Laboratory. 0-0-2-2:1

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

MC-201: Constitution of India . 3-0-0-3:0

Objective:			
1.	To have basic knowledge about Indian Constitution.		
2.	To understand the structure and functioning of union, state and local self-government.		
3.	To understand the structure, jurisdiction and function of Indian judiciary.		
Pre-Requisite			
1.	NIL		
Unit	Content	Hrs	Marks
1	**Indian Constitution:** Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy	5	
2	**Union government and its administration:** Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha. **State government and its administration:** Governor: Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions	10	
3	**Supreme court:** Organization of supreme court, procedure of the court, independence of the court, jurisdiction and power of supreme court. **High court:** Organization of high court, procedure of the court, independence of the court, jurisdiction and power of supreme court. **Subordinate courts:** constitutional provision, structure and jurisdiction. National legal services authority, Lok adalats, family courts, gram nyayalays. Public interest litigation (PIL): meaning of PIL, features of PIL, scope of PIL, principle of PIL, guidelines for admitting PIL	10	
4	**Local Administration:**	10	

	District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.		

Text books:

1. Indian polity, M, Laxmikanth, MC Graw Hill education, 5th Edition.

Reference books

1. DD Basu, " Introduction to the constitution of India", 21st Edition, Lexis Nexis Books Publication ltd, India

Course Outcome: After completion of this course, the learners will be able to

1. describe
   - different features of Indian constitution..
   - power and functioning of Union, state and local self-government.
   - structure, jurisdiction and function of Indian Judiciary.
   - basics of PIL and guideline for admission of PIL.
   - Functioning of local administration starting from block to Municipal Corporation.
2. identify authority to redress a problem in the profession and in the society.

Special Remarks:
The above mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

MAN-181: Induction Program: <u>No Credit:</u> 3 weeks entry program

A Guide:

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 2016.1 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 determining 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 1A Committee of IIT Directors was setup

in the 152nd Meeting of IIT Directors on 6th September 2015 at IIT Patna, on how to motivate undergraduate students at IITs towards studies, and to develop verbal ability. The Committee submitted its report on 19th January 2016. It was considered at the 153rd Meeting of all IIT Directors at IIT Mandi on 26 March 2016, and the accepted report came out on 31 March 2016. The Induction Program was an important recommendation, and its pilot was implemented by three IITs, namely, IIT(BHU), IIT Mandi and IIT Patna in July 2016. At the 50th meeting of the Council of IITs on 23 August 2016, recommendation on the Induction Program and the report of its pilot implementation were discussed and the program was accepted for all IITs.

work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character.

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 awareness, sensitivity and understanding of the self, people around them, society at large, and nature. The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it. The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

**Induction Program as described here borrows from three programs running earlier at different institutions: (1) Foundation Program running at IIT Gadhinagar since July 2011, (2) Human Values course running at IIIT Hyderabad since July 2005, and (3) Counseling Service or mentorship running at several IITs for many decades. Contribution of each one is described next.

(1) IIT Gandhinagar was the first IIT to recognize and implement a special 5-week Foundation Program for the incoming 1st year UG students. It took a bold step that the normal classes would start only after the five week period. It involved activities such as games, art, etc., and also science and other creative workshops and lectures by resource persons from outside.

(2) IIIT Hyderabad was the _rst one to implement a compulsory course on Human Values. Under it, classes were held by faculty through discussions in small groups of students, rather than in lecture mode. Moreover, faculty from all departments got involved in conducting the group discussions under the course. The content is non-sectarian, and the mode is dialogical rather than sermonizing or lecturing. Faculty were trained beforehand, to conduct these discussions and to guide students on issues of life.

(3) Counseling at some of the IITs involves setting up mentor-mentee network under which 1st year students would be divided into small groups, each assigned a senior student as a student guide, and a faculty member as a mentor. Thus, a new student gets connected to a faculty member as well as a senior student, to whom he/she could go to in case of any difficulty whether psychological, financial, academic, or otherwise.

The Induction Program defined here amalgamates all the three into an integrated whole, which leads to its high effectiveness in terms of building physical activity, creativity, bonding, and character. It develops sensitivity towards self and one's relationships, builds awareness about others and society beyond the individual, and also in bonding with their own batch-mates and a senior student besides a faculty member. Scaling up the above amalgamation to an intake batch of 1000 plus students was done at IIT(BHU), Varanasi starting from July 2016.

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 6 am for light physical exercise or yoga. There would also be games in the evening 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, now 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 sta_ in the hostel 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. The Universal Human Values Course is a result of a long series of experiments at educational institutes starting from IIT-Delhi and IIT Kanpur in the 1980s and 1990s as an elective course, NIT Raipur in late 1990s as a compulsory one-week o_ campus program. The courses at IIT(BHU) which started from July 2014, are taken and developed from two compulsory courses at IIIT Hyderabad first introduced in July 2005.

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 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 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 facilities.

3 Schedule

The activities during the Induction Program would have an Initial Phase, a Regular Phase and a Closing Phase. The Initial and Closing Phases would be two days each.

3.1 Initial Phase

Time Activity Day 0

Whole day Students arrive - Hostel allotment. (Preferably do preallotment)

Day 1

09:00 am - 03:00 pm Academic registration

04:30 pm - 06:00 pm Orientation

Day 2

09:00 am - 10:00 am Diagnostic test (for English etc.)

10:15 am - 12:25 pm Visit to respective depts.

12:30 pm - 01:55 pm Lunch

02:00 pm - 02:55 pm Director's address

03:00 pm - 05:00 pm Interaction with parents

03:30 pm - 05:00 pm Mentor-mentee groups - Introduction within group. (Same as Universal Human Values groups)

3.2 Regular Phase

After two days is the start of the Regular Phase of induction. With this phase there would be regular program to be followed every day.

3.2.1 Daily Schedule

Some of the activities are on a daily basis, while some others are at specified periods within the Induction Program. We _rst show a typical daily timetable. Session. Time Activity Remarks

Day 3 onwards

06:00 amWake up call

I 06:30 am - 07:10 am Physical activity (mild exercise/yoga), 07:15 am - 08:55 am Bath, Breakfast, etc.

II 09:00 am - 10:55 am Creative Arts / Universal Human Values, Half the groups do Creative Arts

III 11:00 am - 12:55 pm Universal Human Values / Creative Arts, Complementary alternate

01:00 pm - 02:25 pm Lunch

IV 02:30 pm - 03:55 pm Afternoon Session See below.

V 04:00 pm - 05:00 pm Afternoon Session See below.

05:00 pm - 05:25 pm Break / light tea

VI 05:30 pm - 06:45 pm Games / Special Lectures

06:50 pm - 08:25 pm Rest and Dinner

VII 08:30 pm - 09:25 pm Informal interactions (in hostels)

Sundays are off. Saturdays have the same schedule as above or have outings.

53.2.2 Afternoon Activities (Non-Daily)

The following five activities are scheduled at different times of the Induction Program, and are not held daily for everyone:

1. Familiarization to Dept./Branch & Innovations
2. Visits to Local Area
3. Lectures by Eminent People
4. Literary
5. Proficiency Modules

Here is the approximate activity schedule for the afternoons (may be changed to suit local needs):

Activity Session Remarks

Familiarization with Dept/Branch & Innovations

IV For 3 days (Day 3 to 5)

Visits to Local Area IV, V and VI

For 3 days - interspersed (e.g., 3 Saturdays)

Lectures by Eminent People

IV As scheduled - 3-5 lectures

Literary (Play / Book Reading / Lecture)

IV For 3-5 days

Proficiency Modules V Daily, but only for those who need it

3.3 Closing Phase

Time Activity

Last But One Day

08:30 am - 12 noon Discussions and finalization of presentation within each group

02:00 am - 05:00 pm Presentation by each group in front of 4 other groups besides their own (about 100 students)

Last Day

Whole day Examinations (if any).May be expanded to last 2 days, in case needed.

3.4 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 mentor-mentee 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.

3.4.1 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.)

3.4.2 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.

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 meta skills 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 We are aware that there are advantages in mixing the students from different depts. However, in mixing, it is our experience that the continuity of the group together with the faculty mentor breaks down soon after. Therefore, the groups be from the same dept. but hostel wings have the mixed students from different depts. For example, the hostel room allotment should be in alphabetical order irrespective of dept. nature, and character to follow through. It also makes them react on their relationship with their families and extended family in the college (with hostel sta_ 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, GautamBiswas, IIT Guwahati, Timothy Gonsalves, IIT Mandi, Pushpak Bhattacharya, IIT Patna, (Committee of IIT Directors), March 2016, IIT Directors' Secretariat, IIT Delhi.