SHIVAJI UNIVERSITY, KOLHAPUR - 416 004, MAHARASHTRA
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शिवाजी विद्यापीठ, कोल्हापूर - ४१६ ००४, महाराष्ट्र
दूरध्वनी - ईपीएबीएक्स - २६०९०००, अभ्यासमंडळे विभाग दुरध्वनी विभाग ०२३१–२६०९०९३/९४

Estd. 1962
"A++" Accredited by NAAC(2021)
With CGPA 3.52

SU/BOS/Sci & Tech/ 706 **Date 30/09/2023**

To,

The Director,
Departments of Technology,
Shivaji University,
Kolhapur.

Subject: Regarding revised syllabus of **B. Tech. Programme (Department of Technology)** First Year (Sem-I-II) under the Faculty of Science and Technology as per National Education Policy 2020.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabus B. Tech. First Year (Sem - I & II) under the Faculty of Science & Technology as per National Education Policy 2020.

B. Tech. Programme (Department of Technology)

1.	Civil Engineering
2.	Mechanical Engineering
3.	Computer Science and Technology
4.	Chemical Engineering
5.	Electronics and Telecommunication Engineering
6.	Food Technology

B. Tech First Year (Sem – I & II) all Branches syllabus and Rules, Regulation, Guidelines, Structure and equivalence shall be implemented from the academic year 2023- 2024 onwards. A soft copy containing syllabus is attached herewith and it is available on university website **www.unishivaji.ac.in. (Student Online Syllabus).**

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

Dr. S. M. Kubal
Dy. Registrar

Copy to:

1	The I/c Dean, Faculty of Science & Technology	6	Appointment Section
2	The Chairpersan, Respective Board of Studies	7	Affiliation Section (T.1)
3	Director, Examination and Evaluation	8	Affiliation Section (T.2)
4	Eligibility Section	9	P.G.Admission Section
5	O.E. – 4	100	P.G Seminar Section

Shivaji University

Vidya Nagar, Kolhapur, Maharashtra 416004

Department of Technology

As per NEP2020 guidelines

First Year to Final Year B. Tech (Chemical Engineering) Curriculum Structure

2023-24 onwards

A. Definition of Credit

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
2 Hr. Practical(Lab) per week	1 Credit

B. Credits for award of Degrees

a) A total of credits **168** for a student are required to be eligible to get **Under Graduate degree in Engineering (Major).**

b) A student will be eligible to get **Under Graduate degree** with **additional Minor Specialisation**, if the candidate earns an **additional 16 credits.** These could be acquired by completing the respective courses from the pool by the respective Program. (The courses could be through MOOCs also). The candidate will have liberty to go for minor from the discipline itself or from multidisciplinary options too. Even the candidate can go for double minors too.

c) A student will be eligible to get **Under Graduate degree** with **Honors,** if the candidate earns an **additional 18 credits.** Out of these 18 credits, 15 credits will be against 5 different theory courses (3 credits each) pertaining to the Major Discipline while 3 credits will be against an advance laboratory practice in the respective discipline of studies. These theory credits could be acquired preferably through MOOCs the title of which will be well declared to the aspirants who will chose the same from the pool of courses.

d) A student will be eligible to get **Under Graduate degree with Honors and Research**, if the candidate, in addition to those **18** credits allotted to the Honors, earns an **additional of 3 credits against an extra research project.** Thus the total credits requirement for the **Degree with Honors and Research** will be **21.** (As regards this extra project work, it is mandatory to be successful in publishing at least one research paper based on the research topic.)

C. Component wise distribution of Credits

(Expected range of credits as per AICTE & NEP2020 guidelines is 160-176)

Sr. No.	Category Suggested	Course Code	No. of Credits	Components %
1.	Humanities and Social Sciences including Management & Environment Courses	HSMEC	04	2.39
2.	Indian Knowledge System	IKS	03	1.79
3.	Ability Enhancement Course	AEC	03	1.79
4.	Value Education Courses	VEC	02	1.19
5.	Basic Science courses	BSC	28	16.66
6.	Engineering Science Courses including workshop, drawing, basics of civil/electrical/mechanical/computer etc.	ESC	34	20.23

7.	Professional Core Courses	PCC	60	35.71
8.	Professional Elective Courses relevant to chosen specialization/branch	PEC	06	3.57
9.	Open subjects – Electives from other technical and /or emerging subjects	OEC	12	7.14
10.	Project , Seminar and Internship	PSI	16	9.52
11.	Vocational and Skill Enhancement Courses	VSEC	Audit Courses	-
12.	Project Based Learning	PBL		
13	Mandatory Audit Courses [Some other courses Decided at the Institute level but that do not get fit in the credits]	MAC (HSMEC)*		
	Total		168	**100**

* Please note that most of the courses under HSMEC have been covered under audit courses.

D. Course code and Definition

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
ISE	In Semester Examination
ESE	End Semester Examination
IE	Internal Evaluation
EE	External Evaluation
BSC	Basic Science Course
ESC	Engineering Science Course
HSMEC	Humanities and Social Sciences including Management , Environmental Course
PCC	Professional Core Course
PEC	Professional Elective Course
OEC	Open Elective Courses
VSEC	Vocational and Skill Enhancement Courses
IKS	Indian Knowledge System
AEC	Ability Enhancement Course
VEC	Value Education Course
MAC	Mandatory Audit Course
PSI	Project, Seminar, Internship
PBL	Project Based Learning
PBL, PBI	Project Based Learning Program Based Internship
MN , HN, HNR	Minor , Honors, Honors with Research
CC, DC	Certificate Course, Diploma Course
CHE	Chemical Engineering

Mandatory Induction Program at FY B. Tech First Term Commencement

(3 Weeks Duration)

a) Physical activity
b) Creative Arts
c) Universal Human Values
d) Literary
e) Proficiency Modules
f) Lectures by Eminent People
g) Visits to local Areas
h) Familiarization to Dept./Branch & Innovations

Note: On the campus, besides the curriculum structure, as co-curricular activities, National Cadet Corps (India) i.e. NCC is available for the interested & selected students while National Service Scheme i.e. NSS unit is for all the volunteer students who will contribute as and when necessarily called for the services.

Shivaji University, Kolhapur

Department of Technology

First Year B. Tech (All Programs), Semester- I

Physics Group : Teaching and Evaluation Scheme

S.N.	Category	Course Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	Basic Science Course	BSC111	Engineering Physics	03	-	02	05	04	30:70	50:00
2.	Basic Science course	BSC112	Engineering Mathematics –I	03	01	-	04	04	30:70	50:00
3.	Engineering Science Courses	ESC111	Elements of Mechanical and Electronics Engineering	04	-	02	06	05	30:70	50:00
4.	Engineering Science Courses	ESC112	Engineering Mechanics	03	-	02	05	04	30:70	50:00
5.	Engineering Science Course	ESC113	Computer Programming for Engineers	02	-	02	04	03	30:70	50:00
6.	Indian Knowledge System	IKS111	Yoga and Meditation	01	-	-	01	01	-	50:00
				-	-	-	-	**21**	**500**	**300**
7.	Humanities & Social Sciences, Management, Environment Courses	HSMEC 111	Professional Communication (English)-I	02	-	-	02	IE at Course in charge end		
8.	Vocational and Skill Enhancement Courses	VSEC111	Design Thinking and Innovation-I	01	01	-	02	IE at Course in charge end		
			Total Hours	19	02	08	**29**	-	-	-

Note: After the First Semester of F.Y. B. Tech, the students will undergo 10 days Social Internship and its evaluation will be done in the Second Semester.

Shivaji University, Kolhapur

Department of Technology

First Year B. Tech (All Programs), Semester- I

Chemistry Group : Teaching and Evaluation Scheme

S.N.	Category	Course Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	Basic Science Course	BSC111	Engineering Chemistry	03	-	02	05	04	30:70	50:00
2.	Basic Science Course	BSC112	Engineering Mathematics –I	03	01	-	04	04	30:70	50:00
3.	Engineering Science Course	ESC111	Elements of Civil and Electrical Engineering	04	-	02	06	05	30:70	50:00
4.	Engineering Science Course	ESC112	Engineering Graphics	03	-	02	05	04	30:70	50:00
5.	Engineering Science Course	ESC113	Electrical-Electronic Components and Devices	02	-	02	04	03	30:70	50:00
6.	Indian Knowledge System	IKS111	Yoga and Meditation	01	-	-	01	01	-	50:00
				-	-	-	-	**21**	**500**	**300**
7.	Humanities & Social Sciences, Management, Environment Courses	HSMEC 111	Professional Communication (English)-I	02	-	-	02	IE at Course in charge end		
8.	Vocational and Skill Enhancement Courses	VSEC111	Design Thinking and Innovation-I	01	01	-	02	IE at Course in charge end		
			Total Hours	19	02	08	**29**	-	-	-

Note: After the First Semester of F.Y. B. Tech, the students will undergo 10 days Social Internship and its evaluation will be done in the Second Semester.

Shivaji University, Kolhapur

Department of Technology

First Year B. Tech (All Programs), Semester- II

Physics Group, Teaching and Evaluation Scheme

S. N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	Basic Science Course	BSC121	Engineering Chemistry	03	-	02	05	04	30:70	50:00
2.	Basic Science Course	BSC122	Engineering Mathematics – II	03	01	-	04	04	30:70	50:00
3.	Engineering Science Course	ESC121	Elements of Civil and Electrical Engineering	04	-	02	06	05	30:70	50:00
4.	Engineering Science Course	ESC122	Engineering Graphics	03	-	02	05	04	30:70	50:00
5.	Engineering Science Course	ESC123	Electrical-Electronic Components and Devices	02	-	02	04	03	30:70	50:00
6.	Indian Knowledge System	IKS121	Human Rights and Constitution	01	-	-	01	01	-	50:00
				-	-	-	-	**21**	**500**	**300**
7.	Humanities & Social Sciences, Management, Environment Courses	HSMEC 121	Professional Communication (English)-II	02	-	-	02	IE at Course in charge end		
8.	Vocational and Skill Enhancement Courses	VSEC121	Design Thinking & Innovation-II	01	01	-	02	IE at Course in charge end		
9.	Project Seminar Internship	PSI 121	Social Internship	After Semester 1, 10 days internship preferably in a rural area.				IE at Course in charge end		
			Total Hours	19	02	08	**29**	-	-	-

Shivaji University, Kolhapur

Department of Technology

First Year B. Tech (All Programs), Semester- II

Chemistry Group : Teaching and Evaluation Scheme

S.N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	Basic Science Course	BSC121	Engineering Physics	03	-	02	05	04	30:70	50:00
2.	Basic Science Course	BSC122	Engineering Mathematics – II	03	01	-	04	04	30:70	50:00
3.	Engineering Science Course	ESC121	Elements of Mechanical and Electronics Engineering	04	-	02	06	05	30:70	50:00
4.	Engineering Science Course	ESC122	Engineering Mechanics	03	-	02	05	04	30:70	50:00
5.	Engineering Science Course	ESC123	Computer Programming for Engineers	02	-	02	04	03	30:70	50:00
6.	Indian Knowledge System	IKS121	Human Rights and Constitution	01	-	-	01	01	-	50:00
				-	-	-	-	**21**	**500**	**300**
7.	Humanities & Social Sciences, Management, Environment Course	HSMEC 121	Professional Communication (English)-II	02	-	-	02	IE at Course in charge end		
8.	Vocational and Skill Enhancement Courses	VSEC121	Design Thinking and Innovation-II	01	01	-	02	IE at Course in charge end		
9.	Project Seminar Internship	PSI 121	Social Internship	After Semester 1, 10 days internship preferably in a rural area.				IE at Course in charge end		
			Total Hours	19	02	08	**29**	-	-	-

Shivaji University, Kolhapur

Department of Technology

Second Year B. Tech (Chemical Engineering), Semester- III

Teaching & Evaluation Scheme

S.N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	Basic Science Course	BSC211	Applied Chemistry-I (Physical, Inorganic& Analytical)	03	-	02	05	04	30:70	50:50
2.	Basic Science course	BSC212	Engineering Mathematics – III	03	01	-	04	04	30:70	50:00
3.	Professional Core Courses	PCC 211	Fluid Flow Operations	03	01	02	06	05	30:70	50:50
4.	Professional Core Courses	PCC 212	Chemical Engineering Thermodynamics	03	01	-	04	04	30:70	00:00
5.	Engineering Science Courses	ESC211	Material Science & Engineering	03	-	-	03	03	30:70	00:00
6.	Ability Enhancement Courses	AEC211	Soft Skills Development	01	-	-	01	01	-	50:00
				-	-	-	-	**21**	**500**	**300**
7.	Project Based Learning	PBL211	Mini Project I & Industrial Visit	-	01	-	01	IE at Course in charge end		
8.	Humanities, Social Sciences, Management, Environment	HSMEC 211	Environmental Studies	02	-	-	02	University Exam at year end		
			Total Hours	18	04	04	**26**	-	-	-

Shivaji University, Kolhapur

Department of Technology

Second Year B. Tech (Chemical Engineering), Semester- IV

Teaching & Evaluation Scheme

S.N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	Basic Science Course	BSC 221	Applied Chemistry –II (Organic)	03	-	02	05	04	30:70	50:00
2.	Professional Core Course	PCC 221	Heat Transfer Operations	03	01	02	06	05	30:70	50:50
3.	Professional Core Course	PCC 222	Mechanical Operations	03	-	02	05	04	30:70	50:50
4.	Professional Core Course	PCC 223	Inorganic Chemical Technologies	03	-	-	03	03	30:70	00:00
5.	Professional Core Course	PCC 224	Chemical Process Calculations	03	01	-	04	04	30:70	00:00
6.	Indian Knowledge Systems	IKS 221	Introduction to Performing Arts	01	-	-	01	01	-	50:00
				-	-	-	-	**21**	**500**	**300**
7.	Mandatory Audit Course	MAC 221	Aptitude Enhancement Course I	-	01	-	01	IE at Course in charge end		
8.	Project Based Learning	PBL221	Mini Project II & Industrial Visit	-	01	-	01	IE at Course in charge end		
9.	Humanities, Social Sciences, Management Environment	HSMEC 221	Environmental Studies	02	-	-	02	University Exam at year end		
			Total Hours	18	04	06	**28**	-	-	-

Shivaji University, Kolhapur

Department of Technology

Third Year B. Tech (Chemical Engineering), Semester- V

Teaching & Evaluation Scheme

S.N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	Engineering Science Course	ESC311	Thermal Engineering & Plant Utilities	03	-	-	03	03	30:70	00:00
2.	Professional Core Course	PCC311	Mass Transfer Operations-I	03	01	02	06	05	30:70	00:50
3.	Professional Core Course	PCC312	Chemical Reaction Engineering	03	01	02	06	05	30:70	50:50
4.	Professional Core Course	PCC313	Organic Chemical Technologies	03	-	02	05	04	30:70	50:50
5.	Humanities and Social Sciences , Management Environmental Course	HSMEC 311	Safety in Chemical Industry	03	-	-	03	03	30:70	00:00
6.	Ability Enhancement Course	AEC 311	Introduction to Foreign Language	01	-	-	01	01	-	50:00
				-	-	-	-	**21**	**500**	**300**
7.	Mandatory Audit Course	MAC311	Aptitude Enhancement Course II		01	-	01	IE at Course in charge end		
8.	Project Based Learning	PBL311	Mini Project III & Industrial Visit		-	02	02	IE at Course in charge end		
			Total Hours	16	03	08	**27**	-	-	-

Shivaji University, Kolhapur

Department of Technology

Third Year B. Tech (Chemical Engineering), Semester- VI

Teaching & Evaluation Scheme

S.N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	Engineering Science Course	ESC321	Process Instrumentation & Control	03	-	02	05	04	30:70	50:00
2.	Professional Core Course	PCC321	Mass Transfer Operations-II	03	01	02	06	05	30:70	50:50
3.	Professional Core Course	PCC322	Chemical Equipment & Plant Design	03	-	02	05	04	30:70	50:00
4.	Professional Elective Course	PEC321	Elective I	03	-	-	03	03	30:70	00:00
5.	Open Elective Course	OEC 321	Open Elective –I	03	-	-	03	03	30:70	00:00
6.	Humanities and Social Sciences , Management, Environmental Course	HSMEC 321	Industrial Safety, Health & Hazard Management	-	01	-	01	01	00:00	50:00
7.	Ability Enhancement Course	AEC321	Mini Project IV & Industrial Visit	-	-	02	02	01		50:00
				-	-	-	-	**21**	**500**	**300**
8.	Vocational and Skill Enhancement Course	VSEC321	Design Thinking & Innovation – III	01	-	-	01	IE at Course in charge end		
9.	Mandatory Audit Course	MAC 321	Aptitude Enhancement Course III	-	01	-	01	IE at Course in charge end		
			Total Hours	16	03	08	**27**	-	-	-

Shivaji University, Kolhapur

Department of Technology

Final Year B. Tech (Chemical Engineering), Semester- VII

Teaching & Evaluation Scheme

S.N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	Program Core Course	PCC411	Process Modeling &Simulation	03	-	02	05	04	30:70	00:50
2.	Program Core Course	PCC412	Piping & Instrumentation: Design & Drawing	03	01	02	06	05	30:70	50:00
3.	Program Core Course	PCC413	Transport Phenomena	03	-	-	03	03	30:70	00:00
4.	Program Elective Course	PEC 411	Elective II	03	-	-	03	03	30:70	00:00
5.	Open Elective Course	OEC 411	Open Elective- II	03	-	-	03	03	30:70	00:00
6.	Project Seminar Internship	PSI 411	Major Project Work	-	01	02	03	02	00:00	50:100
7.	Value Education Course	VEC411	Green Technology & Sustainability	01	-	-	01	01	-	50:00
							-	**21**	**500**	**300**
8.	Project Based Learning	PBL411	Major Project Lab		01	02	03	IE at Course in charge end		
			Total Hours	16	03	08	**27**	-	-	-

Shivaji University, Kolhapur

Department of Technology

Final Year B. Tech (Chemical Engineering), Semester- VIII

Teaching & Evaluation Scheme

S.N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	Project Seminar Internship	PSI 421	Industrial Internship (Follow up by the Department)	Entire Semester to be spent in industry				10	00:00	100:200
2.	Open Elective Course [SWAYAM (NPTEL) or any other MOOCs]	OEC 421	Open Elective –III (Through MOOC*)	03	-	-	03	03	30:70	00:00
3.		OEC 422	Open Elective –IV (Through MOOC *)	03	-	-	03	03	30:70	00:00
4.	Project Seminar Internship	PSI 423	Online Seminars	-	02	-	02	02	00:00	50:00
5.		PSI 424	Plant Design & Case Studies (Online)**	01	-	02	03	02	30:70	50:50
6.	Value Education Course	VEC421	Professional Ethics (Through MOOC)	01	-	-	01	01	-	50:00
				-	-	-	-	**21**	**300**	**500**
			Total Hours (Other than Internship)	**08**	**02**	**02**	**12**	-	-	-

*There is an option for End Semester Examination either on respective MOOC platform or at the course teacher's end through the University System.
** Though the course is to be completed online either through course coordinator or via suitable MOOC if any, the ISE will be coordinated by the course in charge and the ESE will be through University system.

Shivaji University, Kolhapur

Department of Technology

B. Tech (Chemical Engineering), Minor Degree

Teaching & Evaluation Scheme

S.N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	Preferably on SWAYAM (NPTEL) or any other MOOCs (Minor Program Core) Or In a Face-to-Face mode	MN-1	MN-Minor I	03	-	-	03	03	30:70	00:00
2.		MN-2	MN-Minor II	03	-	-	03	03	30:70	00:00
3.		MN-3	MN-Minor III	03	-	-	03	03	30:70	00:00
4.		MN-4	MN-Minor IV	03	-	-	03	03	30:70	00:00
5.	Minor Program Based Internship	MN-PBI	Industrial Internship (Minor Program Specific Industry)	One Month				04	00:00	50:50
				-	-	-	-	**16**	**400**	**100**
			Total Hours	12	00	00	**12**	-	-	-

Note: The workload against the B.Tech Minors will be finalized at the Program Level considering the strength of students opting for the Minor.

Credits for B. Tech (Minor) will be over and above the credits 168 required for the B. Tech (Major)
Specializations available are:

1. B. Tech (Pharmaceutical Technology)
2. B. Tech (Food Processing Technology)
3. B, Tech (Alcohol Technology)
4. B. Tech (Oils and Paints Technology)

Note1: The Program will have pool of the courses (Either Conventional or the MOOCs) from which the aspirants will choose these four courses and they may earn these credits during **SY B. Tech to Final Year of their studies.**

Shivaji University, Kolhapur

Department of Technology

B. Tech (Chemical Engineering), Honors

Teaching & Evaluation Scheme

S.N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	SWAYAM (NPTEL) or any other MOOCs Or Self-study mode with University's End Semester Examination (Program Core Courses)	HN- 1	HN-Course I	03	-	-	03	03	30:70	00:00
2.		HN- 2	HN- Course II	03	-	-	03	03	30:70	00:00
3.		HN- 3	HN- Course III	03	-	-	03	03	30:70	00:00
4.		HN- 4	HN- Course IV	03	-	-	03	03	30:70	00:00
5.		HNR – 5	HNR - Course V	03	-	-	03	03	30:70	00:00
6.	Ability Enhancement Course	HNR-AEC1	HNR- Advanced Laboratory Practice	-	-	06	06	03	-	50:00
				-	-	-	-	**18**	**500**	**50**
			Total Hours	15	00	06	**21**	-	-	-

Note: The workload against the B. Tech Honors will be finalized at the Program Level considering the strength of students opting for the Honors.

Note1: The Program will have declaration of pool for these courses either through MOOCs' or from a conventional list for self-studies. From this pool, the aspirants will choose the courses.

Note2: These courses / MOOCs will be different than those to be opted in the VIII semester of B. Tech Major.

Note 3: B. Tech (Honors) will be eligible to join the Second Year of PG program in the same specialisation.

Note 4: Students may earn these credits during **SY B. Tech to Final Year of their studies.**

Shivaji University, Kolhapur

Department of Technology

B. Tech (Chemical Engineering), Honors with Research

Teaching & Evaluation Scheme

S.N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	SWAYAM (NPTEL) or any other MOOCs Or Self-study mode with University's End Semester Examination (Program Core Courses)	HNR- 1	HNR -Course I	03	-	-	03	03	30:70	00:00
2.		HNR – 2	HNR - Course II	03	-	-	03	03	30:70	00:00
3.		HNR – 3	HNR - Course III	03	-	-	03	03	30:70	00:00
4.		HNR – 4	HNR - Course IV	03	-	-	03	03	30:70	00:00
5.		HNR – 5	HNR - Course V	03	-	-	03	03	30:70	00:00
6.	Ability Enhancement Course	HNR-AEC1	HNR- Advanced Laboratory Practice	-	-	06	06	03	-	50:00
7.	Project Based Learning	HNR –PBL	*Additional Research Project	-	-	06	06	03	00:00	00:50
				-	-	-	-	21	500	100
			Total Hours	15	-	12	27	-	-	-

Note: The workload against the B. Tech Honors with Research will be finalized at the Program Level considering the strength of students opting for the Honors with Research. ***Research Project to be treated successful upon publishing of 1 research paper in a reputed Research Journals.**

Note1: The Program will have declaration pool of these courses/MOOCs from which the aspirants will choose the courses/MOOCs.

Note2: These courses or MOOCs will be different than those to be opted in the VIII semester of B. Tech Major.

Note 3: A successful B. Tech (Honors with Research) will be eligible to get enrolled to PhD in same or allied field.

Note 4: Students may earn these credits during SY B. Tech to Final Year of their studies.

Shivaji University, Kolhapur

Department of Technology

B. Tech (Chemical Engineering), Exit After First Year (Certificate Course in Chemical Engineering)

Teaching & Evaluation Scheme

S.N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	SWAYAM (NPTEL) or any other MOOCs Or Face to face mode Or Self-Study Mode (Program Core Courses)	CC- CHE1	Fundamentals of Chemical Engineering	02	-	-	02	02	30:70	00:00
2.		CC- CHE2	Introduction to Distributed Control System	02	-	-	02	02	30:70	00:00
3.	Program Based Internship	CC-PBI	In plant Training	One Month				04	00:00	50:50
				-	-	-	-	**08***	**200****	**100**
			Total Hours	**04**	-	-	**04**	-	-	-

Note: The Workload against the Certificate Course will be finalised at the Program Level considering the strength of the students seeking for the Certificate. *Obtaining these credits will be in addition to 42 regular credits at FY B. Tech

** There is an option for End Semester Examination either on respective MOOC platform if any or through the University System.

Note 1: The students aspiring to exit after first year will undergo the study of courses/MOOC from the list provided by the Program.

Note 2: Program Specific Industry Internship to be completed by such students before commencement of SY B. Tech.

Shivaji University, Kolhapur

Department of Technology

B. Tech (Chemical Engineering), Exit After Second Year (Diploma in Chemical Engineering)

Teaching & Evaluation Scheme

S.N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	SWAYAM (NPTEL) or any other MOOCs Or Face to face mode Or Self-Study Mode (Program Core Courses)	DC- CHE1	DC- Course I	02	-	-	02	02	30:70	00:00
2.		DC- CHE 2	DC- Course II	02	-	-	02	02	30:70	00:00
3.		DC- CHE 3	DC- Course III	02	-	-	02	02	30:70	00:00
4.	Program Based Internship	DC-PBI	In plant Training	One Month				04	00:00	50:50
				-	-	-	-	**10***	**300****	**100**
			Total Hours	**06**	-	-	**06**	-	-	-

Note: The Workload against the Diploma Course will be finalised at the Program Level considering the strength of the students seeking for the Diploma.

*****Obtaining these credits will be in addition to 84 regular credits up to SY B. Tech. Also in such cases, acquiring certificate after First Year is mandatory.

****** There is an option for End Semester Examination either on respective MOOC platform if any or through the University System.

Note 1: The students aspiring to exit after the second year will undergo the study of courses/MOOC from the list provided by the Program.

Note 2: Program Specific Industry Internship to be completed by such students before commencement of TY B. Tech.

Salient Feature of the revision made in line with NEP 2020 Guidelines

(Major means the respective 6 UG Programs available on the Campus at the Department of Technology)

I. **B. Tech Major:** The award of B. Tech Major is upon earning the routine no of credits i.e. 168 (Total 8 Semester @ 21 Credits=168 credits.) along with those mandatory audit courses in each semester. **As usual if these graduates want to pursue PG, it will be of 2 years duration for them.**

II. **B. Tech Minors:** There will be at least one option from each Program floated for the minor degree): Additional 16 Credits are mandatory to be earned. (With award of an Additional Degree of the respective minor specialization): **The interested students have to pay separate fees for the same. (Split up of these 16 Credits is as follows: 03 Credits x 4 course=12 + 04 Credits against an in-plant training of 30 days at the respective sector e. g If its B. Tech Food Processing Technology, the mandatory training would be from Food Sector.)** The candidate will have liberty to go for minor from the discipline itself or from multidisciplinary options too. Even the candidate can go for double minors too.

III. **B. Tech (Honors):** There will be additional **18** credits out of which **15** credits will be earned through successful completion of 05 MOOCs 3 Credits each **plus 3** credits will be against a course in advanced laboratory practice from the major. (The MOOCs need to be other than MOOCs of Semester VIII). The MOOCs to be completed throughout four years starting from second year. **The interested students have to pay separate fees for the same. Such a candidate will be eligible to enter at the Second Year of PG in the respective specialisation as per NEP 2020 guidelines.**

IV. **B. Tech (Honors with Research):** There will be **18 credits** earned as in case of Honors **plus** there will be 3 more credits earned against an additional Project Work with success in publishing at least one research paper based on the research topic. **The interested students have to pay separate fees for the same. Such a candidate will be eligible as per NEP 2020 guidelines for pursuing PhD studies.**

V. **Multiple entry and multiple exit feature:**

1. **After First year,** any candidate desiring exit from first year with a claim to be an awardee of certificate course in respective specialisation, the enrolee has to complete (in addition to the First Year Credits 42 in number), two, '2 credits theory courses' and a skill based 4 credits course (i.e. 1 Month industrial training). These additional 08 credits to be earned by such aspirants. The details of these courses to be defined by the respective specialisation and designed and well narrated to the aspirants. **The interested students have to pay separate fees for the same.**
2. **After Second Year,** any candidate desiring to exit from second year with a claim to be an awardee of Diploma in respective specialisation, the enrollee has to complete (in addition to the First Year and Second Year Credits 84 in number), two, '3 credits theory courses' and a skill based 4 credits course (i.e. 1 Month industrial training). These additional 10 credits to be earned by such aspirants. The

details of these courses to be defined by the respective specialisation and designed and well narrated to the aspirants. **The interested students have to pay separate fees for the same.**

3. In case of multiple entry-multiple exit features, to undergo the one month internship against the certificate and diploma, also in case of all other internships, the selection of skill imparting industry or organisation will be preferably from the **AICTE approved SKPs (Skill knowledge Providers)** list.

VI. About the courses through MOOCs : In case of the non-availability of the MOOCs, the students will prepare for the course in a self-study mode under the mentorship of a teacher assigned by the respective Program Coordinator and the Director of the Department of Technology. The students also will have option to choose to appear for the End Semester Examination either by the MOOCs organisers or that by the Shivaji University.

N.B.: All the students will be mandatorily enrolled under the academic bank of credits. As regards, multiple entries, any student from same specialisation who desires to join at second, third or Final Year has to have accumulation of those minimum numbers credits up to the last year of his entry year in his account.

Note: Also one more feature of this revision is that besides the curriculum structure, as co-curricular activities, National Cadet Corps (India) i.e. NCC and National Service Scheme i.e. NSS units are available for the interested ones the selections of whom will be as per the respective norms.

Pool of Courses under various features

As per this revision of B. Tech curriculum in line with NEP2020, here is an exhaustive pool of courses for opting by different aspirants under different features namely: 1-year certificate, diploma in respective Major Program, B. Tech Minor, Elective I and Elective II under B. Tech Major and B. Tech Honors.

I. Pool of Courses against Multiple entry-multiple exit (Certificate & Diploma)

1. Fundamentals of Chemical Engineering (For 1-year Certificate)
2. Introduction to DCS (For 1-year Certificate)
3. Analytical methods and instrumentation (For Diploma)
4. Introduction to Software Tools in Chemical Industry (For Diploma)
5. Basics of Mass and Energy Balance (For Diploma)

However, for aspirants' interested to leave after Second Year B. Tech with a claim for Diploma in Chemical Engineering, the candidate has to have completion of the courses against 1 year certification also.

II. Pool of Courses against Minors

1. Pharmaceutical Technology

(Any four from the following list)

1. Unit operations in the pharmaceutical industry
2. Pharmaceutical Chemistry
3. Pharmacology
4. Pharmaceutical dosage forms
5. Medical Chemistry and Drug Discovery.
6. Herbal Drug Technology.
7. Drug Regulations and IPR

2. Alcohol Technology

(Any four from the following list)

1. Industrial Fermentation.
2. Industrial Microbiology
3. Alcohol Manufacturing
4. Technology of Malting and Brewing
5. Sugar Industry By-products.
6. Sugar Manufacturing Processes

3. Food Processing Technology

(Any four from the following list)

1. Principles of Food Preservation
2. Fundamentals of Food Analysis
3. Food Additives
4. Food Laws and Standards
5. Basics of Flavour Technology

4. Oils and Paints Technology

1. Introduction to Surface Coatings and their components
2. The Technology of Fats and Fat Based Products
3. The Technology of Essential Oils
4. The Technology of Formulation and Manufacture of Coatings

III. Pool of Courses for Program Core Elective I (Semester VI)

1. Biochemical Engineering
2. Petroleum Refinery Engineering
3. Advanced Separation Techniques
4. Polymer Chemistry
5. Introduction to Food Process Engineering
6. Green Chemistry and Catalysis
7. Environmental Science and Microbiology
8. Drugs and Pharmaceutical Technology

IV. Pool of Courses for Program Core Elective II (Semester VII)

1. Petrochemical Technology
2. Industrial Biotechnology
3. Polymer Technology
4. Food Process Technology
5. Interfacial Science and Engineering
6. Environmental Chemistry and Biochemistry
7. Advanced Materials

V. Pool of Courses against Open Elective I to IV (From Semester VI onwards of the Major Degree) & Honors I to V

In case of Open Electives, I and II students will have option to choose any course from the list of open elective pools from across the institute (Department of Technology) while Open Electives III and IV would be said as self-study courses via MOOCs. In case of non-availability of the MOOCs, the Department to have the detailed course contents for those courses. However, in this case, the end semester examination may either be by the respective institute offering the MOOCs or it could be through the course in charge as per the University System.

Note: The Program will finalise the list from the below mentioned primary list

1. Materials Processing
2. Introduction to House Hold Water Treatment and Storage
3. Introduction to Nanotechnology
4. Data Science
5. Computational Fluid Mechanics
6. Chemical Engineering Applications of AI and Machine Learning
7. Supply Chain Management

8. Total quality management
9. Fundamentals of Digital Marketing and E-Commerce
10. Biology for Engineers
11. Industrial Economics & Management
12. Industrial Pollution Control
13. Process Economics & Project Engineering
14. Introduction to Cement Technology
15. Introduction to Pulp and Paper Technology
16. Introduction to Sugar and Alcohol Technology
17. Introduction to Dyes and Pigments Technology
18. Introduction to Pharmaceutical Technology
19. Introduction to Surface Coating Technology
20. Introduction to Energy Technology
21. Introduction to Process and Project Engineering
22. Introduction to Piping and Plumbing Engineering
23. Introduction to Green Technology

Equivalence for the curriculum revision at B. Tech Chemical Engineering

We at the B. Tech Chemical Engineering, Department of Technology due for revision in curriculum w.e.f. 2023-2024 have revised the structure and the content as well at the F.Y.B. Tech Chemical Engineering. The entire structure for Second Year Final Year B. Tech Chemical Engineering is also designed under this revision. The detailed of course content will be designed and submitted as the First Year batch proceed year to year.

A special mention rather feature of this revision is, ***it is in line with New National Education Policy 2020 guidelines.*** It is our every effort to incorporate most of the key features of NEP2020. Also it has taken due care to match with the National Credit Framework requirements as well as an attempt is made to make it in alignment with AICTE Model curricula.

Following is a semester wise table that depicts equivalences for the previous version of curriculum with the new one.

SEM – I

Sr. No.	First Year B. Tech Semester I Pre-revised syllabus	First Year B. Tech Semester I Revised syllabus	Remark
1.	Engineering Mathematics–I	Engineering Mathematics–I	Content is revised
2.	Engineering Physics (Theory & Lab)	Engineering Physics (Theory & Lab)	Content is revised
3.	Basics of Mechanical Engineering (Theory & Lab)	-	-
4.		Elements of Mechanical and Electronics Engineering (Theory & Lab)	Two courses of the previous version are clubbed.
5.	Engineering Mechanics (Theory & Lab)	Engineering Mechanics (Theory & Lab)	Content is revised
6.	Basic Electronics Engineering (Theory & Lab)	-	Clubbed with other course.
7.	Computer Programming (Lab)	Computer Programming for Engineers (Theory & Lab)	Content is revised
8.	Workshop Practice (Lab)	-	A new course called Design thinking & Innovation is introduced in lieu.
9.	-	Professional Communication (English)-I (Theory)	Content is revised, split in I & II, It is as an audit course.
10.	-	Design Thinking and Innovation-I	Newly introduced audit course.
11.	-	Yoga and Meditation	Newly introduced

			Credit course.

SEM – II

Sr. No.	First Year B. Tech Semester II Pre-revised syllabus	First Year B. Tech Semester II Revised syllabus	Remark
1.	Engineering Mathematics–II	Engineering Mathematics–II	Content is revised.
2.	Engineering Chemistry (Theory & Lab)	Engineering Chemistry (Theory & Lab)	Content is revised.
3.	Engineering Graphics (Theory & Lab)	Engineering Graphics (Theory & Lab)	Content is revised.
4.	Basic Civil Engineering (Theory & Lab)	-	-
5.	-	Elements of Civil and Electrical Engineering (Theory & Lab)	Two courses are clubbed with content revision
6.	Basic Electrical Engineering (Theory & Lab)	-	-
7.	-	Electrical-Electronic Components and Devices (Theory & Lab)	Two courses are clubbed with content revision
8.	Programming with Scilab and Matlab (Lab)	-	-
9.	Professional Communication (Lab)	Professional Communication (English)-II (Theory)	Content is revised, split in I & II, It is as an audit course.
10.	-	Design Thinking and Innovation-II	Newly introduced audit course.
11.	-	Social Internship	Newly introduced audit course
12.	-	Human Rights and Constitution	Newly introduced Credit course.

SEM – III

Sr. No.	Second Year B. Tech Semester III Pre-revised syllabus	Second Year B. Tech Semester III Revised syllabus	Remark
1	Chemistry-I (Theory & Lab)	Applied Chemistry-I (Physical, Inorganic& Analytical) (Theory & Lab)	Content is revised, title is changed.
2	Chemical Engineering Thermodynamics-I	Chemical Engineering Thermodynamics	Clubbed in a single course with content revision.
3	Engineering Mathematics-III	Engineering Mathematics-III	Content is revised.
4	Chemical Process Calculations	-	Shifted to next semester.
5	-	Material Science & Technology	Shifted from next Semester.
6	Fluid Flow Operations (Theory & Lab)	Fluid Flow Operations (Theory & Lab)	Content revision
7	Computer Programming for ChemicalEngineers (Theory & Lab)	-	Taken care in open electives listing.
8	Analytical Chemistry Laboratory (Lab)	-	Clubbed in other course.
9	Environmental Studies	Environmental Studies	No change as it is centrally offered by the University.
10	Soft Skills Development	Soft Skills Development	Content is revised and made it as a Credit course
11	-	Mini Project I & Industrial Visit	Newly introduced audit course.

SEM – IV

Sr. No.	Second Year B. Tech Semester IV Pre-revised syllabus	Second Year B. Tech Semester IV Revised syllabus	Remark
1	Chemistry-II (Theory & Lab)	Applied Chemistry-II (Organic) (Theory & Lab)	Title change with content revision
2	Chemical Engineering Thermodynamics-II	-	Clubbed in a single course.
3	Material Science & Technology	-	Shifted to previous semester.
4	Heat Transfer Operations (Theory & Lab)	Heat Transfer Operations (Theory & Lab)	Content revision.
5	Introduction to Performing Arts	Introduction to Performing Arts	Made it as a Credit course with content revision.
6	Mechanical Operations (Theory & Lab)	Mechanical Operations (Theory & Lab)	Content revision
7	Applied Electrical & Electronics Theory, Laboratory (Lab)	-	Taken care in list of open electives.
8	Mini Project	Mini Project II & Industrial Visit	Newly added audit course.
9	-	Inorganic Chemical Technologies	Shift of semester.
10	-	Chemical Process Calculations	Shifted to previous semester.
11	-	Aptitude Enhancement Course I	Newly introduced.
12	-	Environmental Studies	No change.

SEM – V

Sr. No.	Second Year B. Tech Semester V Pre-revised syllabus	Second Year B. Tech Semester V Revised syllabus	Remark
1	Thermal Engineering and Plant Utilities	Thermal Engineering and Plant Utilities	Content revision.
2	Inorganic Chemical Technologies	-	Shifted to IV semester.
3	-	Organic Chemical Technologies (Theory & Lab)	Shift of semester with content revision.
4	Safety in Chemical Industry	Safety in Chemical Industry	Content revision.
5	Mass Transfer Operations-I (Theory & Lab)	Mass Transfer-I (Theory & Lab)	Content revision.
6	Case Studies and Seminar	-	Shifted to last semester.
7	Chemical Reaction Engineering-I (Theory & Lab)	Chemical Reaction Engineering (Theory & Lab)	Clubbed in a single course with content revision.
8	Industrial Safety and Hazard Management (Tutorial)	-	Shift of semester.
9	Internship I	-	Shifted to last semester.
10	-	Introduction to Foreign Language	Made it as a Credit course
11	-	Aptitude Enhancement Course II	Newly introduced.
12	-	Mini Project III & Industrial Visit (Lab)	Newly introduced.

SEM – VI

Sr. No.	Second Year B. Tech Semester VI Pre-revised syllabus	Second Year B. Tech Semester VI Revised syllabus	Remark
1	Chemical Reaction Engineering-II (Theory & Lab)	-	Clubbed in a single course with content revision.
2	Organic Chemical Technologies (Theory & Lab)	-	Shifted to previous semester
3	Industrial Pollution Control	-	
4	Mass Transfer Operations-II (Theory & Lab)	Mass Transfer-II (Theory & Lab)	Content revision.
5	Micro Project	Mini Project IV & Industrial Visit	Made it as a Credit course with title change
6	Process Instrumentation and Control (Theory & Lab)	Process Instrumentation and Control (Theory & Lab)	Content revision.
7	Industrial Visits	-	Clubbed with mini project.
8	-	Chemical Equipment & Plant Design (Theory & Lab)	Content revision with title change.
9	-	Elective I	Shift of semesters.
10	-	Open Elective I	Newly added.
11	-	Industrial Safety, Health & Hazard Management (Tutorial)	Shift of semester with content revision.
12	-	Design Thinking & Innovation - III	Newly introduced.
13	-	Aptitude Enhancement Course III	Newly introduced.

SEM – VII

Sr. No.	Second Year B. Tech Semester VII Pre-revised syllabus	Second Year B. TechSemester VII Revised syllabus	Remark
1	Biochemical Engineering	-	Well taken care in Program Core Elective Pool.
2	Elective-I	-	Shift of semester.
	-	Elective-II	Added a Program Core Elective.
3	Industrial Economics and Management	-	Well taken care in Open Elective Pool.
4	Process Equipment Design (Theory & Lab)	-	Title is changed with semester shift.
5	Major Project-Phase I	Major Project Work (Lab)	Content revision.
6	Process Modeling and Simulation (Theory & Lab)	Process Modeling and Simulation (Theory & Lab)	Content Revision.
7	Internship II	-	Shifted to last semester.
8	Comprehensive Tests	-	Dropped out on account of reduction in course credits.
9	Audit Course V Introduction to Indian Constitution	Green Technology & Sustainability	Newly added Credit course.
10	-	Piping & Instrumentation: Design & Drawing (Theory & Lab)	Content revision with shift of semester.
11	-	Transport Phenomena	Content revision with shift of semester.
12	-	Open Elective- II	Newly introduced.
13	-	Major Project Lab	Content revision.

SEM – VIII

Sr. No.	Second Year B. Tech Semester VIII Pre-revised syllabus	Second Year B. TechSemester VIII Revised syllabus	Remark
1	Energy Resources and Utilization	-	Well taken care in Program Elective Pool.
2	Elective-II (Open Elective)	Open Elective –III Preferably on MOOC*	Newly introduced.
3	Plant Design and Drawing (Lab)	Plant Design & Case Studies (Online)*	Content revision and mode change to online.
4	Special Chemical Technologies	-	Dropped out due to reduction in credits.
5	Transport Phenomena	-	Shifted to previous semester with content revision.
6	Major Project-Phase II	-	Shifted to previous semester and clubbed in one sem.
7	Industrial Visits	-	Clubbed with Mini Projects.
8	Process Economics and Project Engineering	-	Well taken care under Open Elective Pool.
9	Piping & Instrumentation Design and Drawing	-	Shifted to previous semester.
10	Seminar	Online Seminars	Mode is changed.
11	Audit Course VI Professional Ethics	MOOC III (Professional Ethics)	Mode is changed and made it as a Credit Course
12	-	Industrial Internship (Follow up by the Department)	Newly introduced.
13	-	Open Elective –IV Preferably on MOOC *	Newly introduced. Online mode.

Shivaji University
Vidya Nagar, Kolhapur, Maharashtra 416004

Department of Technology

As per NEP2020 guidelines

First Year B. Tech (All Programs) Detailed Curriculum

2023-24 onwards

A. Definition of Credit

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
2 Hr. Practical(Lab) per week	1 Credit

B. Credits for award of Degrees

a) A total of credits **168** for a student are required to be eligible to get **Under Graduate degree in Engineering (Major).**

b) A student will be eligible to get **Under Graduate degree** with **additional Minor Specialization**, if the candidate earns an **additional 16 credits.** These could be acquired by completing the respective courses from the pool by the respective Program. (The courses could be through MOOCs also). The candidate will have liberty to go for minor from the discipline itself or from multidisciplinary options too. Even the candidate can go for double minors too.

c) A student will be eligible to get **Under Graduate degree** with **Honors,** if the candidate earns an **additional 18 credits.** Out of these 18 credits, 15 credits will be against 5 different theory courses (3 credits each) pertaining to the Major Discipline while 3 credits will be against an advance laboratory practice in the respective discipline of studies. These theory credits could be acquired preferably through MOOCs the title of which will be well declared to the aspirants who will chose the same from the pool of courses.

d) A student will be eligible to get **Under Graduate degree with Honors and Research**, if the candidate, in addition to those **18** credits allotted to the Honors, earns an **additional of 3 credits against an extra research project.** Thus the total credits requirement for the **Degree with Honors and Research** will be **21.** (As regards this extra project work, it is mandatory to be successful in publishing at least one research paper based on the research topic.)

C. Component wise distribution of credits

(Expected range of credits as per AICTE & NEP2020 guidelines is 160-176)

The respective UG Programs have mentioned the component wise distribution of credits in their FY to Final Year Structure document. However, as a common policy, all the UG Programs at Department of Technology there are total 168 Credits for the eight semesters B.Tech Major.

D. Course code and Definition

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical

ISE	In Semester Examination
ESE	End Semester Examination
IE	Internal Evaluation
EE	External Evaluation
BSC	Basic Science Course
ESC	Engineering Science Course
HSMEC	Humanities and Social Sciences including Management , Environmental Course
PCC	Professional Core Course
PEC	Professional Elective Course
OEC	Open Elective Courses
VSEC	Vocational and Skill Enhancement Courses
IKS	Indian Knowledge System
AEC	Ability Enhancement Course
VEC	Value Education Courses
MAC	Mandatory Audit Course
PSI	Project, Seminar, Internship
PBL	Project Based Learning
PBL, PBI	Project Based Learning Program Based Internship
MN , HN, HNR	Minor , Honors, Honors with Research
CC, DC	Certificate Course, Diploma Course
CHE, CE,CST	Chemical Engineering, Civil Engineering, Computer Science and Technology
ETC, FT, ME	Electronics and Telecommunication Engineering, Mechanical Engineering, Food Technology

Mandatory Induction Program at FY B. Tech First Term Commencement
(3 Weeks Duration)

a) Physical activity
b) Creative Arts
c) Universal Human Values
d) Literary
e) Proficiency Modules
f) Lectures by Eminent People
g) Visits to local Areas
h) Familiarization to Dept./Branch & Innovations

Note: On the campus, besides the curriculum structure, as co-curricular activities, National Cadet Corps (India) i.e. NCC is available for the interested & selected students while National Service Scheme i.e. NSS unit is for all the volunteer students who will contribute as and when necessarily called for the services.

E. Four-year B. Tech. Program Academic Rules and Regulations

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14.	R.B.T. 14	Audit Courses
15.	R.B.T. 15	Award of Grades for Re-Examination
16.	R.B.T. 16	Showing & Supplying Photocopy of the Evaluated Semester End Examination Answer Paper, Re-Evaluation, And Period of Retention
17.	R.B.T. 17	Change of Branch
18.	R.B.T. 18	Disciplines and Conduct
19.	R.B.T. 19	Details regarding B.Tech Major, Minor, Honors, Honors with Research, Multiple entry, multiple exit features

Glossary

B. Tech.: Bachelor of Technology, an Under Graduate Degree awarded from the Shivaji University, Kolhapur

Director: Director, Department of Technology, Shivaji University, Kolhapur

Program: The specialization in B.Tech (Particular Major Branch)

Program Head: The Head of the Specialized Branch of B.Tech studies

DC: Department Committee

DEC: Departmental Examination Coordinator

Semester: The academic year will be divided into two regular semesters of approximately 20 weeks' duration each. Typically, the odd semester will be from the first week of July to last week of November while the even semester will be from the first week of January to the last week of May. This will include the period of academic delivery (14 to 15 weeks), Internal Evaluation (CIE) i.e. In Semester Examination and Assignments, End Semester Examination (ESE) assessment and declaration of results.

R.B.T.: Rule B.Tech

Course: Subject

Course Coordinator: Subject teacher

Course Credit: Weighted sum of the number of Lecture hours (L), Tutorial hours (T), and Practical hours (P) associated with the course.

Credits Earned: The sum of course credits for credit courses in which a student has passed.

Grade: Assessment of the student's performance in a course indicated by the letters, "AA", "AB", "BB", "BC", "CC", "CD", "DD", "FF", "XX", "ABSENT", "PP", "NP".

Grade Point: Number equivalent of the letter grades given by 10, 9, 8, 7, 6, 5, 4 corresponding to grades "AA", "AB", "BB", "BC", "CC", "CD", "DD" respectively. "FF" and "XX" carry zero grade points.

Instructor: Member of faculty who will be assigned to teach a specific course.

Semester Grade Points: The sum of the products of credits and Grade Points for each course registered by a student in a semester.

SGPA: Semester Grade Point Average

CGPA: Cumulative Grade Point Average

ATKT: Allowed to Keep Terms.

R.B.T. 1 Admission:

At the Department of Technology, Shivaji University, candidates are admitted to all the available specialized B.Tech Programs according to norms and conditions prescribed as per AICTE, New Delhi and DTE, Mumbai, Maharashtra.

R.B.T. 2 Award of Degree:

Following rules prevail for the award of degree:

1. B.Tech Degree will be awarded to the student, who has registered and earned all the credits of prescribed courses under the general departmental requirements.
2. In addition to the credit requirement prescribed above for the Degree award, each student will have to complete the requirements of Audit Course (AC) during the programme. All the students will receive certification as PP *(for Passed)*, and NP *(for not passed)* in AC, in the mark sheet. While obtaining certification as PP is a mandatory requirement for the Degree award of a student, this will not be taken into account for computing the final Cumulative Grade Point Average.
3. A student has obtained CGPA ≥ 4.5.
4. A student has paid all the institute dues and satisfied all the requirements prescribed.
5. A student has no case of indiscipline pending against him/her.
6. University authorities will recommend the award of B. Tech. Degree to a student who is declared to be eligible and satisfies the said norms.

R.B.T. 3 Attendance Rule:

All students must attend every lecture, tutorial and practical class. However, to account for late registration, sickness or other such contingencies, the attendance requirement will be a minimum of 75% of the classes actually held. A student with less than 75% attendance in a course during the semester, in lectures, tutorials and laboratories taken together (as applicable), will be awarded an 'XX' grade in that course irrespective of his/her performance in the tests.

Attendance record will be maintained based upon roll calls (or any equivalent operation) in every scheduled lecture, tutorial and practical class. The course coordinator will maintain and consolidate attendance record for the course (lectures, tutorials and laboratories together, as applicable).

R.B.T. 4 Academic Progress Rules (ATKT Rules)

1. A student will be allowed to register for the courses of the next year's odd semester only if the candidate has earned all the credits of the previous year and the failure in maximum three passing heads (SEE, EE) will be considered for deciding the eligibility for ATKT.
2. For the promotion to the Third Year, student should not have failure in more than three passing heads (ESE, EE) of Second Year and all credits of First Year must have been earned.
3. For the promotion to the Final Year, student should not have failure in more than three passing heads (ESE, EE) of Third Year and all credits of Second Year must have been earned.
4. A student who has obtained 'FF' grade in ESE of a regular semester and has obtained 'FF' grade in 2nd attempt of ESE will be eligible to choose one of the two options below to clear the backlog:
5. Re-registration for the next regular semester course whenever that course is offered.
6. Application for Repeated Examination.
7. A student who has been detained in a regular semester and obtained 'XX' grade can Re-register for the next regular semester whenever it is offered.
8. The maximum duration for getting B. Tech. degree for students admitted in the first semester of U.G. program will be 12 semesters (six academic years) while for lateral entry students admitted in the third semester will be 10 semesters (five academic years) from their date of admission. The maximum duration of the program includes the period of withdrawal, absence and different kinds of leaves permissible to a student but excludes the period of rustication of a student from the department.
9. If a student is unable to gain all credits of first year in three years from the date of the admission, then the candidate will be declared as "Not Fit for Engineering" leading to discontinuation of candidate's registration with the department.
10. Depending upon the academic progress of a student, department may take a decision regarding continuation or discontinuation of candidate's registration with the institute.

R.B.T. 5 Academic Flexibility

1. Flexibility in deciding curriculum structure and contents of curriculum with reasonable frequency for changes in the same.

2. Continuous assessment of student's performance with newly adopted NEP 2020 Credit system based on Award of Grade.
3. Credits are quite simply a means of attaching relative values to courses different components. These are a currency of learning, and in general regarded as a measure of the time typically required to achieve a given curricular outcome.
4. All courses (year-wise) under each program/discipline are unitized

R.B.T. 6 Credit system:

Education at the Institute is organized around the semester-based credit system of study. The prominent features of the credit system are a process of continuous evaluation of a student's performance/progress and flexibility to allow a student to progress at an optimum pace suited to candidate's ability or convenience, subject to fulfilling minimum requirements for continuation.

A student's performance/progress is measured by the number of credits that the candidate has earned, i.e. completed satisfactorily. Based on the course credits and grades obtained by the student, grade point average is calculated. A minimum grade point average is required to be maintained for satisfactory progress and continuation in the program. Also a minimum number of earned credits and a minimum grade point average should be acquired in order to qualify for the degree. All programs are defined by the total credit requirement and a pattern of credit distribution over courses of different categories.

R.B.T. 7 Features of Credit System at Department of Technology, Shivaji University, Kolhapur:

Every course is allotted credits based on its academic importance/weightage.

1. All courses may not have same credits.
2. 21 credits / semester.
3. Absolute grading System with 7 passing Grades viz. AA, AB, BB, BC, CC, CD, DD and FF for failure.
4. Standardization of courses; with few exceptional cases, each course is of 6 units.
5. In Semester Examination (ISE) and End Semester Examination (ESE), both having (30:70) weightage in the student's performance in course work/laboratory work and other activities. A student's performance in a subject will be judged by taking into account the results of In Semester Examination and End Semester Examination together. Students must score 40% marks in ESE irrespective of the ISE marks.

   (Note: The ISE will be conducted as In Semester Exam and assignments throughout the semester on dates announced in advance by the department and its results to be made known

to the students from time to time. However, the dates for the ESE will be fixed at the University level.)

6. Continuous internal evaluation consists of 'In Semester Examination' of 20 marks and assignment of 10 marks handled by Department of Technology and setting of question papers should be done by course coordinator. Assignments may be of varied nature for each course based on the need of the course coordinator.
7. End Semester Examination (ESE) to be conducted by the Department of Technology however setting of question papers will be as per University Rules. The ESE will include a written examination for theory courses and practical/design/drawing examination with built-in oral part for laboratory/ design/drawing courses.

   7.1 End Semester Examination (ESE) of the courses offered for the MOOCs will be conducted by MOOC offering Institute. The credits earned by the students will be communicated to the University and to be converted as per the weightage of the said course in the structure. Student may get failure in the said MOOC or the examination may get delayed by the MOOC offering institute, in either cases, ESE of the said course will be conducted as per the University rules.
8. In case the candidate is absent on the scheduled ISE, request for separate In Semester Examination for the students representing in co-curricular, extracurricular activities or on medical grounds will only be considered. On receipt of application from the student, the DC will take decision for the conduct of the In Semester Examination.
9. Care will be taken to ensure that the total numbers of days for academic work are ≥180 per year.
10. Academic schedule prescribed will be strictly adhered to all the Branches.

R.B.T. 8 Course credits assignment:

Each course, except a few special courses, has a certain number of credits assigned to it depending upon its lecture, tutorial and laboratory contact hours in a week. This weightage is also indicative of the academic expectation that includes in-class contact and self-study outside of class hours.

Lectures and Tutorials: One lecture or tutorial hour per week per semester is assigned one credit.

Practical/Laboratory: One laboratory hour per week per semester is assigned half credit.

Example: Course: Heat Transfer Operations: 05 credits (3-1-2)

The credits indicated for this course are computed as follows:

3 hours/week lectures = 3 credits

1 hours/week tutorial = 1 credit

2 hours/week practical = 2 × 0.5 = 1 credit

Also, (3-1-2) **5** credit course = (**3** h Lectures + **1** h Tutorial + **2** h Practical) per week

= **6** contact hours per week = **5** credits

R.B.T. 9 Detailed Evaluation Scheme:

1. Out of total 100% theory weightage, 30% weightage is allotted for In Semester Examination (ISE). Appearing for ISE is must and student must submit the assignments to become eligible for End Semester Examination (ESE) of respective course.

   ISE (30% weightage) includes:

   a. In Semester Examination of 20 Marks of one Hour
   b. Assignments of 10 Marks during entire semester

2. For the End Semester Examination (ESE), 70 marks question paper will be set in which student must secure 40% (28 Marks out of 70) as university examination pass head and candidate must be appeared for ISE to become eligible for ESE of respective course.
3. Final theory marks (out of 100) will be the addition of ISE (30 Marks) and ESE (70Marks).
4. Final laboratory letter grade will be awarded (100%) will be the addition of IE (50%) and EE (50%) as applicable to the course.
5. End Semester Examination (ESE) for laboratory consists of internal evaluation (IE) and External Evaluation (EE). Nature of the evaluation as viva-voce or practical will be as application to the course which will be well mentioned in the course description.
6. There will be no EE for laboratory courses of the First Year. The entire assessment of a student will be based on IE 100% weightage and a minimum performance of 40% in IE will be required to get the passing grade. IE of laboratory work will be based on turn-by-turn supervision of the student's work and the quality of the candidate's work as prescribed through laboratory journals and the candidate's performance in oral or Practical/Oral examinations uniformly distributed throughout the semester. Student must submit and secure 40% marks in the IE of the concerned course. Non submission of IE will lead to term not grant (TNG).
7. The assessment of laboratory courses from the 3rd semester onwards will be carried out in two parts.

   i. ISE of laboratory will be based on turn-by-turn supervision of the student's work and the quality of candidate's work as prescribed through laboratory journals and the performance in oral or Practical/Oral examinations uniformly distributed throughout the semester. Student must submit and secure 40% marks in the IE of the concerned course. Non submission of IE will lead to term not grant (TNG).
   ii. ESE of laboratory will be based on performing an experiment followed by an oral examination or a written examination.
   iii. The relative weightage for IE and EE for assessment of laboratory courses will be 50% and 50% respectively from second year onwards and a minimum performance of 40% in both IE and EE separately will be required to get the passing grade.

iv. EE for laboratory course will normally be held one week before the ESE for theory courses and will be conducted by a panel of examiners consisting of external and internal examiner. This activity will be coordinated by Department Examination Coordinator (DEC) in consultation with Coordinator of the respective Program.

8. A student failed in EE of a laboratory course in a regular semester will be eligible to appear for examination conducted along with ESE of laboratory courses of the subsequent semester. Such examination will be fairly comprehensive (generally of 3 hours similar to EE i.e. External Examinations) to properly judge candidate's practical skill and theoretical knowledge for that laboratory course. The candidate will suffer a grade penalty as per Table 3.

9. Assessment of Seminar, Mini-project, Major Project, internship etc.:

i. The Seminar/Project report must be submitted by the prescribed date usually two weeks before the end of academic session of the semester.

ii. It is desirable that the topics for seminar/project be assigned by the end of previous semester.

iii. The seminar report and the presentation of seminar will be evaluated by panel of three departmental faculty members (decided by Branch Coordinator).

iv. The mini-project will be evaluated jointly by a panel of three Internal Examiners.

v. The report on field training will be evaluated by a panel of three Internal Examiners.

vi. The assessment of B. Tech major project work will be carried out in two phases as follows:

For IE, there will be

a) Departmental Committee (To approve synopsis submission based on seminar)

b) Project work assessment by Guide

(Departmental Committee constitution will be as follow:

(1) Director- Chairman

(2) Branch Coordinator from respective branch – member

(3) Senior faculty from respective branch – member

(4) Guide/Course Coordinator- member)

EE consists of progress seminar and presentation to be evaluated by panel of internal and external examiners. The process will be as below:

a) Project work assessment by Guide

b) Report submission based on seminar which will be evaluated by Departmental Committee

c) EE (Viva-voce and presentations): Evaluation by panel of external and internal examiners.

vii. The evaluation of industrial internship: Students will undergo industrial internship for one semester (8th Semester). Students have to prepare a report related to the work carried out during this internship. This may include study of the new science/technology, applications of the technology/development of the technology and its implementation /designing/obtaining practical or numerical solution etc. By the Program, there will random and surprise visits to the place of internship so as to record the attendance and performance of the interns. The evaluation will be as per the university examination similar to the project evaluation.

10. The duration of End Semester Examination will be 2.5 hrs however there might be few courses having duration of End Semester Examination as 3 hrs.

11. In respect of IE and Laboratory work, a target date will be fixed for the completion of each sheet, job, Project, experiment or assignment and the same either complete or incomplete will be collected on the target date and assessed immediately at the respective departments by the concerned teachers and % marks (or grades) will be submitted to the Co-ordinator. The Co-ordinator of the Department of Technology will communicate this % of marks (or grades) to the University.

12. In respect of IE of the audit (Non Credit) courses, the respective course in charge will organise and plan activities for the conduct of the evaluation. Preferably, the teacher will announce 5 assignments each one carrying 10 marks. So based on the assignments submitted by the candidate, there will be evaluation out of 50 marks. The passing is for 20 marks. The passing is mandatory for every student. However, the course in charge will communicate to the examination section whether the student has passed the audit course or not. As mentioned earlier, in case of audit courses, the result will appear over the mark sheet and certificate as either PP for passed and NP for not passed.

R.B.T. 10 Earning credits:

At the end of every course, a letter grade is awarded in each course for which a student had registered. On obtaining a pass grade (≥40% minimum grade DD), the student accumulates the course credits as earned credits. A student's performance is measured by the number of credits that the candidate has earned and by the weighted grade point average.

The credit system enables continuous evaluation of a student's performance, and allows the students to progress at an optimum pace suited to individual ability and convenience, subject to fulfilling minimum requirement for continuation.

As regards earning credits against certificate or Diploma award (exit after the first year and the second respectively) also through Honors, Minors, Honors with Research, all these are the optional for the interested ones. The earning of credits for certificate and diploma is mandatory to take place immediately within 45 days from the last day of respective even End Semester Examination. In

case of the credits against the Honors, Minors, Honors with Research, the interested candidates to plan for the same from SY B.Tech to Final Year B.Tech completion. As per the list of interested students to opt for these features, the Department of Technology will plan the activities regarding conduct/mentoring of the course by such students. Further from time to time, the Department will communicate the details of such students to the University Examination section. The students will have their respective End Semester Examination in continuation to the End Semester Examination of the Majors.

The details regarding credits assigned against all these features are elaborated in R.B.T. 19.

R.B.T. 11 CGPA Improvement Policy for award of degree:

A student getting CGPA ≤ 4.50 with grade 'DD' in any course or grade 'FF' in any course will have the possibility to repeat one or more 'DD' graded courses along with the failed courses, /are being offered in a semester.

An opportunity will be given to a student who has earned all the credits required by the respective program with CGPA greater than or equal to 4.00 but less than 4.50, to improve his/her grade by allowing him/her to appear for SEE of maximum two theory courses of seventh and eighth semester.

R.B.T. 12 Evaluation System:

1. **Semester Grade Point Average (SGPA)**

$$= \frac{\sum(\textbf{Course credits in passed courses} \times \textbf{Earned Credits})}{\sum(\textbf{Course credits in registered courses})}$$

2. **Cumulative Grade Point Average (CGPA)**

$$= \frac{\sum(\textbf{Course credits in passed courses} \times \textbf{Earned Credits})\textbf{of all Semesters}}{\sum(\textbf{Course credits in registered courses})}$$

   i. Cumulative Grade Point Average (CGPA) will be calculated cumulatively for Sem. I to Sem. VIII for regular students.

   ii. Cumulative Grade Point Average (CGPA) will be calculated cumulatively for Sem. III to Sem. VIII for lateral entry students.

3. At the end of B. Tech Program, student will be placed in any one of the divisions as detailed below:

Ist Division with distinction	: CGPA $\geq$ 7.5 and above
Ist Division	: CGPA $\geq$ 6.0 and < 7.5
IInd Division	: CGPA $\geq$ 5.5 and < 6.0

New gradation suggested as follows.

Table 1

Grade Points	Equivalent Range
5.5	55%
6.0	60%
6.5	65%
7.0	70%
7.5	75%

Conversion of CGPA to percentage marks for CGPA ≥ **4.5** can be obtained using equation.

Percentage marks = (CGPA x 10)

An example of these calculations is given below:

Typical academic performance calculations - I semester

Table 2

Course no.	Course credits	Grade awarded	Earned credits	Grade points	Points secured
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6 (col4 *col5)
MALXXX	5	CC	5	6	30
CSLXXX	4	CD	4	5	20
PHLXXX	4	AA	4	10	40
PHPXXX	2	BB	2	8	16
MELXXX	4	FF	0	0	00
TTNXXX	2	AB	2	9	18
Total	21		17	38	124

1. Total Points earned for this semester = 124

$$\textbf{Semester Grade Point Average (SGPA)} = \frac{124}{21} = 5.90$$

2. Cumulative Grade Point Average (CGPA) =

Cumulative points earned in all passed courses = 124 (past semesters) + 124 (this semester)

= 248

Cumulative earned credits = 23 (past semesters) + 21 (this sem.) = 44

$$\textbf{Cumulative Grade Point Average (CGPA)} = \frac{\Sigma(124+124)}{\Sigma(23+21)} = 5.63$$

Table 3: System of Evaluation

Grade	Grade Points	Marks obtained (%)			Description of Performance
		Regular Semester	Re-examination	Repeated Examination	
AA	10	90-100	--	--	Outstanding
AB	09	80-89	90-100	--	Excellent
BB	08	70-79	80-89	90-100	Very Good
BC	07	60-69	70-79	80-89	Good
CC	06	50-59	60-69	70-79	Fair
CD	05	45-49	50-59	60-69	Average

DD	04	40-44	40-49	40-59	Poor
DD$	04	Below 40	Below 40	Below 40	Poor (Subject to Application of Ordinance 96)
FF	00	Below 40	Below 40	Below 40	Fail
XX	--	--	--	--	Detained
ABSENT	--	--	--	--	Absent
PP	--	--	--	--	Passed (Audit Course)
NP	--	--	--	--	Not Passed (Audit Course)

Note: An equivalent certificate of CGPA to percentage of marks will be provided to student on candidate's demand after remitting prescribed fees by Shivaji University.

R.B.T. 13 Entry of Students from previous credit to new Credit Pattern

A student of Department of Technology, Shivaji University, Kolhapur admitted before academic year 2023-24 and having backlogs such student will clear back log subjects as per the equivalence given by the respective program.

R.B.T. 14 Audit Courses:

Additional courses are included as audit courses in each semester. While the performance of the student in audit courses will be included in the Grade Card, these grades do not contribute to SGPA or CGPA of the concerned student.

R.B.T. 15 Awards of Grades for Re-Examination:

a) A student who has obtained grade 'FF' in regular semester will be eligible to appear for re-examination conducted before the commencement of the next regular semester.
b) In such cases In Semester Examination performance of a student will not be wiped out.
c) A student will apply for re-examination before the last date of such application and will appear for re-examination.
d) 70% weightage similar to ESE will be given to re-examination.
e) A student who is eligible for re-examination but remains absent for re-examination will be given grade 'Absent'.
f) A student will be awarded a grade between 'AB' to 'DD', or 'FF' or 'XX' as given in Table 3 depending upon the cumulative marks obtained by him/her in IE and Re-examination of ESE. Here a student has to suffer a grade penalty by accepting one grade lower as compared with the regular grades.

R.B.T. 16 Showing Evaluated Semester End Examination Answer Papers, Re-evaluation, and applying for revaluation:

The evaluated answer book will be shown to the student immediately as per the timetable prepared by the exam cell of Department of Technology before the declaration of result. The grievances regarding the incorrect total and assessment of the not assed questions will be done by the respective faculty. A student having doubt regarding the grade declared in a course can apply for the photocopy of the

answer book by remitting the prescribed fee as specified; a student can also apply for rechecking of his/her SEE answer book as per Shivaji University rules. There is no provision for showing of evaluated answer book, photocopy, rechecking and revaluation of the re-examination.

R.B.T. 17 Change of Branch:

Students will be eligible to apply for Change of Branch after completing the first two semesters. The change of branch will be permitted strictly on merit basis subject to the rules and regulations prescribed by Directorate of Technical Education, Maharashtra State/Admission Regulatory authority, Maharashtra State time to time.

R.B.T. 18 Disciplines and Conduct:

i. Every student will be required to observe discipline and decorous behaviour both inside and outside the campus and not to indulge in any activity which will tend to bring down the prestige of the Department.

ii. Any act of indiscipline of a student reported to the Department will be referred as per Shivaji University norms.

iii. If a student while studying in the institute is found indulging in anti-national activities contrary to the provisions of acts and laws enforced by Government, the candidate will be liable to be expelled from the Department without any notice.

iv. If a student is involved in any kind of ragging, the student will be liable for strict action as per Maharashtra anti-ragging act 1999, which is in effect from 15th May 1999.

v. If any statement/information supplied by the student in connection with his/her admission is found to be false/ incorrect at any time, his/ her admission will be cancelled and the candidate will be expelled from the institute and fees paid will be forfeited.

vi. Student once admitted in the Department of Technology will follow instructions issued from time to time.

vii. If a student is found guilty of malpractice in examinations then the candidate will be punished as per the recommendations of the Shivaji University, Kolhapur.

viii. Every admitted student will be issued photo identification (ID) card which must be retained by the student while the candidate is registered at Department of Technology. The student must have valid ID card with him/her while in the Department of Technology.

ix. Any student who alters or intentionally mutilates an ID card or who uses the ID card of another student or allows his/her ID card to be used by another student will be subjected to disciplinary action.

x. The valid ID card must be presented for identification purpose as and when demanded by authorities. Any student refusing to provide an ID card will be subjected to disciplinary action.

R.B.T. 19 Details regarding B.Tech Major, Minor, Honors, Honors with Research, Multiple entry, multiple exit features:

(Major means the respective 6 UG Programs available on the Campus at the Department of Technology)

I. **B.Tech Major:** The award of B.Tech Major is upon earning the routine no of credits i.e. 168 (Total 8 Semester @ 21 Credits=168 credits.) along with those mandatory audit courses in each semester. As usual if these graduates want to pursue PG, it will be of 2 years duration for them.

II. **B. Tech Minors:** There will be at least one option from each Program floated for the minor degree): Additional 16 Credits are mandatory to be earned. (With award of an Additional Degree of the respective minor specialization). Also the candidate will have liberty to go for minor from the discipline itself or from multidisciplinary options. Even the candidate can go for double minors too. The interested students have to pay separate fees for the same. (Split up of these 16 Credits is as follows: 03 Credits x 4 course=12 + 04 Credits against an in-plant training of 30 days at the respective sector e. g If its B. Tech Food Processing Technology, the mandatory training would be from Food Sector.)

III. **B. Tech (Honors):** There will be additional **18** credits out of which **15** credits will be earned through successful completion of 05 MOOCs 3 Credits each **plus 3** credits will be against a course in advanced laboratory practice from the major. (The MOOCs need to be other than MOOCs of Semester VIII). The MOOCs to be completed throughout four years starting from second year. The interested students have to pay separate fees for the same. Such a candidate will be eligible to enter at the Second Year of PG in the respective specialization as per NEP 2020 guidelines.

IV. **B. Tech (Honors with Research):** There will be **18 credits** earned as in case of Honors **plus** there will be 3 more credits earned against an additional Project Work with success in publishing at least one research paper based on the research topic. The interested students have to pay separate fees for the same. Such a candidate will be eligible as per NEP 2020 guidelines for pursuing PhD studies.

V. **Multiple entry and multiple exit feature:**

1. **After First year,** any candidate desiring exit from first year with a claim to be an awardee of certificate course in respective specialization, the enrolee has to complete (in addition to the First Year Credits 42 in number), two, '2 credits theory courses' and a skill based 4 credits course (i.e. 1 Month industrial training). These additional 08 credits to be earned by such aspirants. The details of these courses to be defined by the respective specialization and designed and well narrated to the aspirants. The interested students have to pay separate fees for the same.
2. **After Second Year,** any candidate desiring to exit from second year with a claim to be an awardee of Diploma in respective specialization, the enrollee has to complete (in addition to the

First Year and Second Year Credits 84 in number), two, '3 credits theory courses' and a skill based 4 credits course (i.e. 1 Month industrial training). These additional 10 credits to be earned by such aspirants. The details of these courses to be defined by the respective specialization and designed and well narrated to the aspirants. The interested students have to pay separate fees for the same.

3. In case of multiple entry-multiple exit features, to undergo the one month internship against the certificate and diploma, also in case of all other internships, the selection of skill imparting industry or organisation will be preferably from the **AICTE approved SKPs (Skill knowledge Providers)** list.

VI. **About the courses through MOOCs :** In case of the non-availability of the MOOCs, the students will prepare for the course in a self-study mode under the mentorship of a teacher assigned by the respective Program Coordinator and the Director of the Department of Technology. The students also will have option to choose to appear for the End Semester Examination either by the MOOCs organisers or that by the Shivaji University.

N.B.: All the students will be mandatorily enrolled under the academic bank of credits. As regards, multiple entries, any student from same specialization who desires to join at second, third or Final Year has to have accumulation of those minimum numbers credits up to the last year of his entry year in his account.

Note: Also one more feature of this revision is that besides the curriculum structure, as co-curricular activities, National Cadet Corps (India) i.e. NCC and National Service Scheme i.e. NSS units are available for the interested ones the selections of whom will be as per the respective norms.

Note: All other rules and regulations will be applicable as per Shivaji University, Kolhapur.

F. Engineering Graduate Attributes

1. Domain specific Engineering Knowledge
2. Problem Analysis Ability
3. Acquiring Skills that enable them to Design & Develop Solutions to the Problems
4. Capacity to investigate Complex Problems
5. Familiarity of using Modern Tools
6. Understanding Engineer's role and connectivity towards Society
7. Awareness about Environment & Sustainability
8. Practicing ethics and values
9. Ability to work as an Individual & in a Team also
10. Acquiring Communication skills

11. Becoming well verse with task of Project management & Finance aspects
12. Developing Lifelong Learning attitude

Note: For every program, there are its own Program Educational Objectives (PEOs) while there are 12 Program Outcomes (POs) which are aligned with these graduate attributes for the engineers.

Shivaji University, Kolhapur
Department of Technology

First Year B. Tech (All Programs), Semester- I

Physics Group : Teaching and Evaluation Scheme

S.N.	Category	Course Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	Basic Science Course	BSC111	Engineering Physics	03	-	02	05	04	30:70	50:00
2.	Basic Science course	BSC112	Engineering Mathematics –I	03	01	-	04	04	30:70	50:00
3.	Engineering Science Courses	ESC111	Elements of Mechanical and Electronics Engineering	04	-	02	06	05	30:70	50:00
4.	Engineering Science Courses	ESC112	Engineering Mechanics	03	-	02	05	04	30:70	50:00
5.	Engineering Science Course	ESC113	Computer Programming for Engineers	02	-	02	04	03	30:70	50:00
6.	Indian Knowledge System	IKS111	Yoga and Meditation	01	-	-	01	01	-	50:00
				-	-	-	-	**21**	**500**	**300**
7.	Humanities & Social Sciences, Management, Environment Courses	HSMEC 111	Professional Communication (English)-I	02	-	-	02	IE at Course in charge end		
8.	Vocational and Skill Enhancement Courses	VSEC111	Design Thinking and Innovation-I	01	01		02	IE at Course in charge end		
			Total Hours	19	02	08	**29**	-	-	-

Note: After the First Semester of F.Y. B. Tech, the students will undergo 10 days Social Internship and its evaluation will be done in the Second Semester.

Shivaji University, Kolhapur
Department of Technology

First Year B. Tech (All Programs), Semester- I

Chemistry Group : Teaching and Evaluation Scheme

S.N.	Category	Course Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	Basic Science Course	BSC111	Engineering Chemistry	03	-	02	05	04	30:70	50:00
2.	Basic Science Course	BSC112	Engineering Mathematics –I	03	01	-	04	04	30:70	50:00
3.	Engineering Science Course	ESC111	Elements of Civil and Electrical Engineering	04	-	02	06	05	30:70	50:00
4.	Engineering Science Course	ESC112	Engineering Graphics	03	-	02	05	04	30:70	50:00
5.	Engineering Science Course	ESC113	Electrical-Electronic Components and Devices	02	-	02	04	03	30:70	50:00
6.	Indian Knowledge System	IKS111	Yoga and Meditation	01	-	-	01	01	-	50:00
				-	-	-	-	**21**	**500**	**300**
7.	Humanities & Social Sciences, Management, Environment Courses	HSMEC 111	Professional Communication (English)-I	02	-	-	02	IE at Course in charge end		
8.	Vocational and Skill Enhancement Courses	VSEC111	Design Thinking and Innovation-I	01	01		02	IE at Course in charge end		
			Total Hours	19	02	08	**29**	-	-	-

Note: After the First Semester of F.Y. B. Tech, the students will undergo 10 days Social Internship and its evaluation will be done in the Second Semester.

Shivaji University, Kolhapur
Department of Technology

First Year B. Tech (All Programs), Semester- II

Physics Group, Teaching and Evaluation Scheme

S. N.	Category	Course Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	Basic Science Course	BSC121	Engineering Chemistry	03	-	02	05	04	30:70	50:00
2.	Basic Science Course	BSC122	Engineering Mathematics – II	03	01	-	04	04	30:70	50:00
3.	Engineering Science Course	ESC121	Elements of Civil and Electrical Engineering	04	-	02	06	05	30:70	50:00
4.	Engineering Science Course	ESC122	Engineering Graphics	03	-	02	05	04	30:70	50:00
5.	Engineering Science Course	ESC123	Electrical-Electronic Components and Devices	02	-	02	04	03	30:70	50:00
6.	Indian Knowledge System	IKS121	Human Rights and Constitution	01	-	-	01	01	-	50:00
				-	-	-	-	**21**	**500**	**300**
7.	Humanities & Social Sciences, Management, Environment Courses	HSMEC 121	Professional Communication (English)-II	02	-	-	02	IE at Course in charge end		
8.	Vocational and Skill Enhancement Courses	VSEC121	Design Thinking & Innovation-II	01	01	-	02	IE at Course in charge end		
9.	Project Seminar Internship	PSI 121	Social Internship	After Semester 1, 10 days internship preferably in a rural area.				IE at Course in charge end		
			Total Hours	19	02	08	**29**	-	-	-

Shivaji University, Kolhapur
Department of Technology

First Year B. Tech (All Programs), Semester- II

Chemistry Group : Teaching and Evaluation Scheme

S.N.	Category	Course Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	Basic Science Course	BSC121	Engineering Physics	03	-	02	05	04	30:70	50:00
2.	Basic Science Course	BSC122	Engineering Mathematics – II	03	01	-	04	04	30:70	50:00
3.	Engineering Science Course	ESC121	Elements of Mechanical and Electronics Engineering	04	-	02	06	05	30:70	50:00
4.	Engineering Science Course	ESC122	Engineering Mechanics	03	-	02	05	04	30:70	50:00
5.	Engineering Science Course	ESC123	Computer Programming for Engineers	02	-	02	04	03	30:70	50:00
6.	Indian Knowledge System	IKS121	Human Rights and Constitution	01	-	-	01	01	-	50:00
				-	-	-	-	**21**	**500**	**300**
7.	Humanities & Social Sciences, Management, Environment Course	HSMEC 121	Professional Communication (English)-II	02	-	-	02	IE at Course in charge end		
8.	Vocational and Skill Enhancement Courses	VSEC121	Design Thinking and Innovation-II	01	01	-	02	IE at Course in charge end		
9.	Project Seminar Internship	PSI 121	Social Internship	After Semester 1, 10 days internship preferably in a rural area.				IE at Course in charge end		
			Total Hours	19	02	08	**29**	-	-	-

Year, Program, Semester	F.Y. Part I (All Programs) Semester I and II						
Course Code	BSC111/ BSC121						
Course Category	Engineering Science Course						
Course title	**Engineering Physics (Theory)**						
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits		
	03	-	02	05	04		
Evaluation Scheme	ISE	ESE	IOE	IPE	EOE	EPE	Total
	30	70	---	50	--	--	150
Pre-requisites(if any)	--						
Course Objectives	The course is aimed at - 1. To study the basic concepts of physics and engineering applications of physics. 2. To develop an ability to identify, formulate and solve physics and engineering problems.						
Course Outcomes	Upon completion of this course, student should be able to – 1. Apply the concepts of physics in various engineering applications 2. Use the techniques, skills, and modern tools necessary for physics and engineering careers 3. Understand and apply the concepts of optical fibers in light wave communication systems and in holography. 4. Understand the use of lasers as light sources for low and high energy applications. 5. Understand the nature and characteristics of ultrasonic waves and its various engineering applications.						

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	3										
CO 2	2	3										
CO 3	3	2										
CO 4	3	2										
CO 5	3	3										

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Ultrasonic** Introduction, production of ultrasonic waves- piezo-electric generator, detection of ultrasonic waves, properties of ultrasonic waves, use of ultrasonic for non-destructive testing, Industrial and medical applications of ultrasonic.	7
II	**Optics Interference** Superposition of waves, spatial and temporal coherence, interference in thin films by reflection, Diffraction – Fresnel and Fraunhofer diffractions, Diffraction grating, Determination of wavelength using diffraction grating. Polarization – Types of polarization, polarization by reflection and polarization by scattering	7
III	**Lasers** Introduction, characteristics of lasers, spontaneous and stimulated emission of radiation,	7

	Einstein's coefficients, population inversion, Ruby laser, Helium-Neon laser, Applications of lasers in Industrial, scientific and medical fields. Holography – Basic principles and applications of holography. **Fibre optics:** Principle of optical fibre, cross sectional view of optical fibre, acceptance angle, acceptance cone (no derivation), numerical aperture, step index fibre, graded index fibre, transmission of light in step and graded index fibre, attenuation in optical fibre, applications of optical fibre(medical, military, communication)	
IV	**Crystallography** Basics of crystal structure-space lattice & point lattice, Unit cell, number of atoms per unit cell, coordination number, seven crystal systems, packing fraction for close packed systems, Miller indices. X-Ray diffraction and Bragg's law.	7
V	**Physics of Materials** Superconductivity- General properties, Meissner effect, Type I and Type II superconductors, applications of superconductors Nanoscience: Nano Scale, nanostructured materials, properties of materials at Nano scale: Surface to Volume Ratio, Quantum Confinement effect.	7
VI	**Nuclear and Solar energy Nuclear fission** Discovery of fission, binding energy curve, chain reaction (fission of U235), essentials of nuclear reactor. Nuclear fusion – Thermonuclear reactions, p-p chain, C-N-O cycle. Introduction to particle physics. Solar energy – solar spectrum, Ways of harnessing solar energy-solar photovoltaic and solar thermal devices. In addition a study tour to space observatory at Panhala: study the operations of Indian Regional Navigation Satellite System (IRNSS) programme. (Satellite signal receiver has been installed at Panhala, space centre) or MF RADAR facility, Shivaji University campus, Kolhapur	6

Text Books	
1.	M. N. Avadhanulu and P. G. Kshirsagar "Engineering Physics", S. Chand Publication.
2.	R. K. Gaur and Gupta S. L, "Engineering Physics", Dhanapat Rai and Sons Publication.
3.	V. Rajendran, "Engineering Physics", Tata McGraw Hill Company Ltd, New Delhi
4.	Malik and Singh, "Engineering Physics", Tata Mc Graw Hill Company Ltd, New Delhi
5.	Naidu, "Engineering Physics", Pearson
6.	N.K. Bajaj, The Physics of waves and Oscillations , Tata McGraw Hill Company Ltd, New Delhi
Reference Books	
1.	A. Ghatak, "Optics", S. Chand and Company Ltd
2.	Brijlal and Subramanian, "Optics", 5006, 23rd Edition
3.	B. L. Theraja, "Modern Physics", S. Chand & Company Ltd., Delhi.
4.	Charles Kittle, "Introduction to Solid State Physics," Wiley India Pvt
5.	L. Tarasov, "Laser Physics and Applications," Mir Publishers.
6.	P.K. Palanisamy, "Solid State Physics", SciTech Publications (India) Pvt. Ltd.
Useful web links	
1.	**https://archive.nptel.ac.in/courses/122/107/122107035/**

Year, Program, Semester	F.Y. Part I (All Programs) Semester I and II						
Course Code	BSC111/ BSC121						
Course Category	Engineering Science Course						
Course title	**Engineering Physics (Practical)**						
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Credits		
	03	-	**02**	05	**01**		
Evaluation Scheme	ISE	ESE	IOE	IPE	EOE	EPE	Total
	30	70	---	**50**	--	--	150
Pre-requisites(if any)	--						
Course Objectives	1. To study the basic concepts of physics and engineering applications of physics. 2. To develop an ability to identify, formulate and solve physics and engineering problems.						
Course Outcomes	Upon completion of this course, student should be able to – 1. Apply the concepts of physics in various engineering applications. 2. Use the techniques, skills, and modern tools necessary for physics and engineering careers 3. Use various scientific instruments viz. Spectrometer, polarimter, laser, ultrasonic interferometer for various measurements. 4. Test optical components using principles of interference and diffraction of light 5. Use ultrasonic interferometer for measuring velocity of ultrasound in various liquids						

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3										
CO2	2	3										
CO3	2	3										
CO4	2	3										
CO5	3	2										

Level of Mapping as: Low 1, Moderate 2, High 3

Experiment No.	Experiment Title/Objective	Hours
1.	Diffraction grating - measurement of grating element.	02
2.	Diffraction grating - measurement of wavelength of LASER.	02
3.	XRD pattern of thin films and its analysis.	02
4.	Scanning Electron Microscopy (SEM) studies	02
5.	Divergence of LASER beam.	02

6.	Study of properties of Nano fluids – effect of concentration & temperature.	02
7.	Determination of specific rotation of sugar solution using Polarimeter	02
8.	Dielectric constant of materials.	02
9.	Thermal conductivity in Nano fluids.	02
10.	Calculation of lattice constant from the given powder XRD pattern	02
Reference Books and web links		
1.	Arora Domkundwar, “Refrigeration and Air Conditioning”, Dhanpat Rai and Sons	
2.	Hawkins G. A,"Engineering Thermodynamics", John Wiley and Sons	
3.	Heywood, “I.C. Engines Fundamentals”, McGraw Hill Publication	
4.	V.K.Mehata, "Principles of Electronics ".(New Edn)	
5.	N.N Bharagava, D.C.Kulshreshtha and S.C Gupta(TMH)"Basic Electronics and Linear circuits "	
6.	R.S. Sedha,"A text book of Applied Electronics". (S.Chand &Company)	
7.	**https://www.digimat.in/nptel/courses/video/122104016/L26.html**	
8.	**https://www.digimat.in/nptel/courses/video/122107035/L15.html**	

Year, Program, Semester	F.Y , Part I (All Programs) Semester I							
Course Code	BSC112							
Course Category	Basic Science Course							
Course title	**Engineering Mathematics-I (Differential Calculus) (Theory)**							
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Total Credits**		
	03	01	-	04		04		
Evaluation Scheme	**ISE**	**ESE**	**IOE**	**IPE**	**EOE**	**EPE**	**Total**	
	30	70	50	--	--	--	150	
Pre-requisites(if any)	Basics of Derivatives and Integration							
Course Objectives	1. To familiarize the students with differential Calculus. 2. To teach Mathematical methodologies and models. 3. To develop mathematical skills and enhance logical thinking power of students. 4. To provide students with skills in differential calculus, complex variable which would enable them to devise engineering solutions for given situations they may encounter in their profession.							
Course Outcomes	1. Understand and apply the knowledge of differential Calculus to solve the mathematical problems. 2. Determine partial derivatives and its application in related field of engineering. 3. To understand methods for solution of differential equations of first order and first degree. 4. Evaluation and analysis of analytic function. 5. Understand the features of the Scilab software and its applications.							

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2										
CO 2	3	3										
CO 3	3	2										
CO 4	3	2										
CO 5	3	3										

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Differential Calculus** Successive differentiation, Leibnitz's Theorem and its applications, Taylor and Maclaurin series, Indeterminate forms.	7
II	**Partial Differentiation** Partial derivatives of first and higher order, total differentials, differentiation of composite and implicit functions. Euler's Theorem on Homogeneous functions with two and three independent variables. Deductions from Euler's Theorem, Jacobian, Properties of Jacobian.	8
III	**Differential Equations of first order and first degree and its Applications** Exact differential equations, Equations reducible to exact equations, Linear differential equations, Equations reducible to Linear equations, Applications to Orthogonal trajectories and to Simple Electrical Circuits	7
IV	**Numerical solutions of Differential Equations of first order and first degree** Taylor's series method, Picard's method, Euler's method, Modified Euler's method, Runge-Kutta fourth order formula.	6
V	**Functions of Complex Variables: Differentiation** Algebra of complex number, Circular and hyperbolic functions, Functions of complex variable, Cauchy-Riemann equations, Analytic functions, Harmonic functions.	6
VI	**Programming with Scilab** Introduction, Installation, Basic functions of Scilab, Differentiation, Solutions of differential equations of first order and first degree, Basic operations on Complex numbers, Algebra of complex number.	6
	Suggested list of Assignments- 1. Successive differentiation 2. Applications of Leibnitz theorem 3. Indeterminate form 4. Partial differentiation 5. Euler's Theorem on Homogeneous functions 6. Exact differential Equations 7. Linear differential equations 8. Applications of Differential equations 9. Numerical solutions of Differential equations 10. Analytic Functions 11. Harmonic Functions **General Instructions:** 1. Each Student has to write at least 6 assignments on entire syllabus and at least 4 assignments on Scilab programming (including print out). Students must be encouraged to write mathematical programs in tutorial class only. 2. Batch wise tutorials are to be conducted. The number of students per batch should be as per the practical batches. 3. Scilab assignments will be based on 1. Differentiation 2. Partial Differentiation 3. Solutions of differential equations of first order and first degree, 4. Basic operations on Complex numbers 5. Algebra of complex number.	

Text Books		
1.	B. S. Grewal, “Higher Engineering Mathematics”, Khanna Publishers, New Delhi.	
2.	Erwin Kreyszig, “Advanced Engineering Mathematics”, John Wiley & Sons.	
3.	B. V. Ramana, “Higher Engineering Mathematics”, Tata McGraw-Hill, New Delhi.	
4.	B. S. Grewal, “Scilab Textbook Companion for Higher Engineering Mathematics”, Khanna Publishers, New Delhi	
Reference Books		
1.	C. R. Wylie, “Advanced Engineering Mathematics”, McGraw Hill Publication, New Delhi.	
2.	Shanti Narayan, “Differential Calculus” S. Chand and company, New Delhi.	
3.	S. S. Sastry, “Engineering Mathematics (Volume-I)”, Prentice Hall Publication, New Delhi.	
4.	M. K. Jain, S. R. K. Iyengar, R. K. Jain, “Numerical Methods for Scientific and Engineering Computation”, New Age International (P) Ltd.	
5.	H. K. Dass, “Advanced Engineering Mathematics”, S. Chand Publishing.	
6.	N. P. Bali, Iyengar “A text book of Engineering Mathematics by”, Laxmi Publications (P)Ltd., New Delhi.	
7.	M. D. Greenberg, “Advanced Engineering Mathematics”, Pearson Education.	
Useful web links		
1.	**https://nptel.ac.in/courses/111105121**	
2.	**https://nptel.ac.in/courses/111106100**	
3.	**https://nptel.ac.in/courses/111107119**	
4.	**https://nptel.ac.in/courses/111105134**	
5.	**https://nptel.ac.in/courses/111105167**	

<table>
<tr><td>Year, Program, Semester</td><td colspan="7">F.Y , Part I (All Programs) Semester I and II</td></tr>
<tr><td>Course Code</td><td colspan="7">ESC111/ ESC121</td></tr>
<tr><td>Course Category</td><td colspan="7">Engineering Science Course</td></tr>
<tr><td>Course title</td><td colspan="7">Elements of Mechanical and Electronics Engineering (Theory)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td colspan="2">Total Contact Hours</td><td colspan="2">Total Credits</td></tr>
<tr><td>04</td><td>-</td><td>02</td><td colspan="2">06</td><td colspan="2">04</td></tr>
<tr><td rowspan="2">Evaluation Scheme</td><td colspan="2">ISE</td><td>ESE</td><td>IOE</td><td>IPE</td><td>EOE</td><td>EPE</td><td>Total</td></tr>
<tr><td colspan="2">30</td><td>70</td><td>---</td><td>50</td><td>--</td><td>--</td><td>150</td></tr>
<tr><td>Pre-requisites(if any)</td><td colspan="7">Basic Physics and Mathematics, Introduction to Engineering, Basic Mechanics, Thermodynamics</td></tr>
<tr><td>Course Rationale</td><td colspan="7">The course offers practical knowledge and skills for understanding and applying various instruments, devices, and systems in real-world scenarios. It provides interdisciplinary perspectives, exploring fields like mechatronics, robotics, and biomedical applications. With a focus on energy sources and sustainability, the course prepares students to tackle the global energy crisis and contribute to environmentally friendly solutions. Studying this course enhances technical competence, critical thinking, problem-solving abilities, and adaptability to evolving technologies in mechanical engineering.</td></tr>
<tr><td>Course Objectives</td><td colspan="7">The course is aimed at
1. Developing the fundamental understanding of various mechanical engineering devices and their applications.
2. Developing the awareness about energy crisis, understanding various non-conventional energy sources.
3. Informing the students about the various roles, responsibilities and job opportunities mechanical engineering graduates have in different sectors.
4. Developing the fundamental understanding of various electronics engineering devices and their applications.
5. Developing the fundamental knowledge of semiconductor devices with applications
6. Provide fundamental knowledge about transistor and power device</td></tr>
<tr><td>Course Outcomes</td><td colspan="7">Upon completion of this course, student should be able to –
1. Recognise the mechanical engineering applications, machines, mechanisms in day to day life.
2. Explain different non-conventional energy sources.
3. Think critically and apply product design procedures to design product with different considerations.
4. Recognise the basics of electronic engineering and their practical use
5. Apply the concepts of diode in rectifiers, filter circuits
6. Understand the concept and use of SCR and power devices</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	3										
CO 2	2	3										
CO 3	3	2										
CO 4	3	2	2									
CO 5	2	3										
CO 6	3	2	1									

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Mechanical Engineering Applications** a) Introduction to various instruments and devices in day to day life – Pumps, Compressors, Gears, Belt drives [types, classification, construction and working, applications] b) Introduction to IC engines (Construction, working, classification of 2 stroke, 4 stroke SI and CI engines), Refrigeration and air conditioning, Vapour compression refrigeration cycle, advantages, applications	7
II	**Conventional and non-conventional energy sources** **a)** Energy crisis, Sources of Energy and its classifications, Renewable energy sources, classification and system Power generation using - Solar energy, wind energy, tidal energy, geothermal energy, hydroelectric power plant. (Construction and working)	7
III	**Horizontals and verticals of Mechanical Engineering** a) Role and job profiles of Mechanical Engineer in various branches of engineering- Mechanical, Civil, Electronics, Computer and Chemical Engineering. b) Interdisciplinary branches of Mechanical Engineering – Mechatronics and Robotics, Biomedical Applications. Energy balance. Energy audit. Industry 4.0 c) Product, product design steps, tools, aesthetic, ergonomic considerations, concurrent engineering	7
IV	**Semiconductors** Conductivity of insulators, metals, and semiconductors in terms of energy bands, the chemical bond in Si and Ge, conductivity of intrinsic semiconductors, extrinsic semiconductors: n-type and p-type semiconductors, Hall Effect in semiconductors, Mechanism in current flow: drift and diffusion, V-I characteristics of PN-junction diode. Diode equivalent circuit, diode as a switch, diode testing.	7
V	**Rectifier and Zener Diode** Need of rectifier, , types of rectifier – half wave rectifier voltage (no derivation) ,ripple, ripple factor ,Need of filters ,types of filters **Zener diode: -** Breakdown mechanism, Zener versus Avalanche Break down, V-I characteristics, application, photo diode and varactor diode.	7
VI	**Introduction to Transistors and Power devices** Transistor construction, Types of transistor (NPN & PNP), Transistor operation and amplifying action. Transistor Characteristics for CB, CE, CC configuration and comparison. **Power devices** - Need of power devices, comparison between low and high power semiconductor devices, Structure, Operation, V-I Characteristics & application of SCR, Triac and diac.	6

Text Books	
1.	G. D. Rai, "Non-Conventional Energy Sources", Khanna Publisher, 4th Edition 2014.
2.	Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3.	Arora C P, "Refrigeration and Air Conditioning", Tata McGraw Hill
4.	C.M. Agrawal and Basant Agrawal, "Basic Mechanical Engineering", Wiley, 2008
5.	R.P.Jain,"Modern Digital Electronics",Tata McGraw Hill,4th edition 2009
6.	Robert Boylestad and Louis Nashelsky, "Electronic Devices and Circuits",Pearson,11th edition,2015
Reference Books	
1.	Arora Domkundwar , "Refrigeration and Air Conditioning", Dhanpat Rai and Sons
2.	Heywood, "I.C. Engines Fundamentals", McGraw Hill Publication
3.	Bernard Grob, Basic Electronics
4.	Madhuri Joshi , Electronics materials &components

Alternative NPTEL/SWAYAM Course

Sr. No.	NPTEL Course Name	Instructor	Host Institute
1.	IC Engines and Gas Turbines	Dr. Vinayak Kulkarni, Prof. Pronab K. Mondal	IIT Guwahati
2.	Product Design and Innovation	Prof. Supradip Das, Prof. Swati Pal, Prof. Debayan Dhar	IIT Guwahati

Useful web links	
1.	**https://ekumbh.aicte-india.org/book.php for mechanical engineering related books by AICTE.**
2.	**https://nptel.ac.in/courses/112103262**
3.	**https://nptel.ac.in/courses/101104063**
4.	**https://nptel.ac.in/courses/107103082**
5.	**https://www.digimat.in/nptel/courses/video/108102097/L01.html**
6.	**https://nptel.ac.in/courses/122106025**

<table>
<tr><td>Year, Program, Semester</td><td colspan="7">F.Y, Part I (All Programs) Semester I and II</td></tr>
<tr><td>Course Code</td><td colspan="7">ESC111/ ESC121</td></tr>
<tr><td>Course Category</td><td colspan="7">Engineering Science Course</td></tr>
<tr><td>Course title</td><td colspan="7">Elements of Mechanical and Electronics Engineering (Practical)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td colspan="2">Total Contact Hours</td><td colspan="2">Credits</td></tr>
<tr><td>04</td><td>--</td><td>02</td><td colspan="2">02</td><td colspan="2">01</td></tr>
<tr><td rowspan="2">Evaluation Scheme</td><td>ISE</td><td>ESE</td><td>IOE</td><td>IPE</td><td>EOE</td><td>EPE</td><td>Total</td></tr>
<tr><td>30</td><td>70</td><td>---</td><td>50</td><td>--</td><td>--</td><td>150</td></tr>
<tr><td>Pre-requisites(if any)</td><td colspan="7">--</td></tr>
<tr><td>Course Rationale</td><td colspan="7">This course aims to give a practical understanding of mechanical engineering applications in day to day life.</td></tr>
<tr><td>Course Objectives</td><td colspan="7">The course is aimed at
1. Informing students about lathe and drilling machines tools and the processes used in manufacturing.
2. Demonstrating - 2 stroke and 4 stroke IC engine, refrigerator
3. Engaging students in hands on experience of designing and product for small problem.
4. To Impart Knowledge about basics of Semiconductor Devices and its parameters
5. To make the students familiar with suitability of various electronics components</td></tr>
<tr><td>Course Outcomes</td><td colspan="7">1. Upon completion of this course, student should be able to –
2. Identify different parts of lathe and drilling machine.
3. Apply the design principles to offer a product design solution to small problem.
4. Identify and explain the details of IC engines and refrigerator.
5. Understand construction , V-I characteristics and application of diode
6. Identify the applications of Diode and SCR</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12
CO1	2	3										
CO2	2	3										
CO3	2	3										
CO4	2	3										
CO5	3	2										
CO6	3				2							

Level of Mapping as: Low 1, Moderate 2, High 3

Experiment No.	Experiment Title/Objective	Hours
1	Study of 2 stroke and 4 stroke IC Engines.	02
2	Study of domestic refrigerator and air conditioner.	02
3	Study of pumps and compressors	02
4	Product development exercise	02
5	Study of lathe and drilling machine	02
6	Study of Characteristics of Si and Ge diodes	02
7	Study of performance characteristics of half wave rectifier with and without filter	02
8	Study of performance characteristics of full wave rectifier with and without filter	02
9	Study of Characteristics of Zener diode	02
Text Books		
1.	Hajra Choudhury, 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.	V. Ganesan, “Internal Combustion Engines”, Tata McGraw Hill, Second Edition.	
4.	P.K. Nag, "Engineering Thermodynamics", Tata McGraw-Hill Publishing Co. Ltd.	
5.	Arora C P, “Refrigeration and Air Conditioning”, Tata McGraw Hill	
6.	N.N Bharagava, D.C.Kulshreshtha & S.C Gupta(TMH)"Basic Electronics & Linear circuits "	
Reference Books		
1.	Arora Domkundwar, “Refrigeration and Air Conditioning”, Dhanpat Rai and Sons	
2.	Hawkins G. A., "Engineering Thermodynamics", John Wiley and Sons	
3.	Heywood, “I.C. Engines Fundamentals”, McGraw Hill Publication	
4.	V.K.Mehata, "Principles of Electronics ".(New Edn)	

Year, Program, Semester	F.Y, Part I (All Programs) Semester I and II						
Course Code	ESC112/ ESC122						
Course Category	Engineering Science Course						
Course title	**Engineering Mechanics (Theory)**						
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**			**Total Credits**
	03	-	02	05			04
Evaluation Scheme	**ISE**	**ESE**	**IOE**	**IPE**	**EOE**	**EPE**	**Total**
	30	70	---	50	--	--	150
Pre-requisites (if any)	Physics, Mathematics						
Course Rationale	Engineering mechanics applies the principle of mechanics to design, taking into account the effects of forces.						
Course Objectives	1. To learn basic concepts and system of forces. 2. To develop skills to use the basic principles of mechanics in engineering applications. 3. To solve problems of statics and dynamics related to engineering domain using principles of mechanics.						
Course Outcomes	1. Calculate resultant force for coplanar concurrent and noncurrent force system. 2. Apply static conditions of equilibrium to calculate reactive forces of structures like beams, trusses etc. 3. Determine center of gravity and moment of inertia of a lamina 4. Apply equations of motion on a body moving along straight path and circular path to determine the motion parameters. 5. Apply dynamic condition of equilibrium on a body to calculate its motion parameters and reactive forces. 6. Apply laws of collision to find energy loss and velocity distribution due to direct and indirect impact						

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	3										
CO 2	2	3										
CO 3	3	2										
CO 4	2	3										
CO 5	2	3										
CO 6	2	3										

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Resolution and composition of force system** Introduction to Mechanics, Force system, concept of Resultant, Composition and Resolution of Forces, Equivalent force system, Moment of a force, Couple, law of parallogram, Varignon's theorem, Resultant of a concurrent and non-concurring force system	8
II	**Equilibrium of rigid body** Concept of Equilibrium, Free Body Diagram, Lami's theorem, analytical conditions of equilibrium, engineering application to beams and trusses. Friction, types of friction, laws of friction.	6
III	**Centroid and moment of Inertia** Centroid of areas, moment of inertia, radius of gyration, polar moment of inertia, theorems of moment of inertia, M.I. of a lamina.	6
IV	**Linear and circular motion of a body** Rectilinear motion, equations of motion, motion diagrams, motion in vertical direction. Circular motion, motion on curved path, supper elevation	8
V	**Kinetics of particles** Newton's second law, Work-Energy principle, Impulse- momentum principle, D'Alembert's Principle.	6
VI	**Collision of a body** Direct and indirect impact, coefficient of restitution, impact on floor and wall, law of collision, loss of kinetic energy.	6
Text Books		
1	S. S. Bhavikattis, "Engineering Mechanics", New Age International Pvt. Ltd	
2	S. Timoshenko, "Engineering Mechanics", McGraw Hill Education	
Reference Books		
1	Meriam J. L., Kraige L. G., "Engineering Mechanics – Statics, Vol.1", Wiley Student Edition, (8th Edition) 2017	
2	Meriam J. L., Kraige L. G., "Engineering Mechanics – Dynamics, Vol.2", Wiley Student Edition, (8th Edition) 2017	
3	R.C.Hibbeler, "Engineering Mechanics", Pearson Publication(14th edition)	
4	Beer F. P. , Johnston E. R., "Vector Mechanics for Engineers -Dynamics", Tata McGraw Hill Publishing company Ltd., New Delhi (12th Edition, SIE)	
5	Shames Irving H., "Engineering Mechanics", Prentice Hall, New Delhi (4th edition)	
Useful web links		
1	**https://www.youtube.com/watch?v=nGfVTNfNwnk**	
2	**https://www.youtube.com/watch?v=6nguX-cEsvw**	
3	**https://archive.nptel.ac.in/courses/112/106/112106286/**	

Year, Program, Semester	F.Y , Part I (All Programs) Semester I and II						
Course Code	ESC112/ ESC122						
Course Category	Engineering Science Course						
Course title	**Engineering Mechanics (Practical)**						
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Credits**	
	03	-	**02**	05		01	
Evaluation Scheme	**ISE**	**ESE**	**IOE**	**IPE**	**EOE**	**EPE**	**Total**
	30	70	-	**50**	-	-	150
Pre-requisites (if any)	Physics, Mathematics						
Course Rationale	Engineering mechanics applies the principle of mechanics to design, taking into account the effects of forces.						
Course Objectives	To perform experiments to verify laws of mechanics and validate the experimental results with analytical results.						
Course Outcomes	1. Perform experiments to verify laws of mechanics 2. Construct force diagrams to find resultant forces 3. Compare the analytical results with experimental results						

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3										
CO2	2	3										
CO3	2	3										

Level of Mapping as: Low 1, Moderate 2, High 3

Experiment No.	Experiment Title	Hours
1.	Verify law of polygon of forces	02
2.	Verify law of Moment using bell crank lever apparatus.	02
3.	Verify beam reactions using beam reaction apparatus.	02
4.	Verify triangle law of forces using Jib crane apparatus	02
5.	Verify centrifugal law of forces using centrifugal apparatus	02

6.	Graphics statics- Resultant force determination (concurrent forces system)	02
7.	Graphics statics- Resultant forces determination (non-concurrent forces system)	02
8.	Graphics statics- Determination of beam reactions	02
9.	Graphics statics- Determination of member forces of a truss	02
10.	Assignments based of theory syllabus	02
11.	Assignments based of theory syllabus	02
12.	Assignments based of theory syllabus	02
Text Books		
1.	S. S. Bhavikattis, “Engineering Mechanics”, New Age International Pvt. Ltd	
2.	S. Timoshenko, “Engineering Mechanics”, McGraw Hill Education	
Reference Books		
1.	Meriam J. L., Kraige L. G., “Engineering Mechanics – Statics, Vol.1”, Wiley Student Edition, (8th Edition) 2017.	
2.	Meriam J. L., Kraige L. G., “Engineering Mechanics – Dynamics, Vol.2”, Wiley Student Edition, (8th Edition) 2017.	
3.	R.C.Hibbeler, “Engineering Mechanics”, Pearson Publication(14th edition)	
4.	Beer F. P. , Johnston E. R., “Vector Mechanics for Engineers -Dynamics”, Tata McGraw Hill Publishing company Ltd., New Delhi (12th Edition, SIE)	
5.	Shames Irving H., “Engineering Mechanics”, Prentice Hall, New Delhi (4th edition)	

Year, Program, Semester	F.Y, Part I (All Programs) Semester I and II						
Course Code	ESC113/ ESC123						
Course Category	Engineering Science Course						
Course title	**Computer Programming for Engineers (Theory)**						
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Total Credits**	
	02	-	02	04		03	
Evaluation Scheme	**ISE**	**ESE**	**IOE**	**IPE**	**EOE**	**EPE**	**Total**
	30	70	---	50	--	--	150
Pre-requisites (if any)	Physics, Mathematics						
Course Objectives	1. Understand the basic terminology used in computer programming 2. Compile and debug programs in C and Implement data structures and algorithms in C						
Course Outcomes	1. Illustrate the flowchart and design of an algorithm for a given problem and to develop C programs using operators Develop conditional and iterative statements to write C programs 2. Design C programs with the use of Pointers to access arrays, strings , functions and Exercise user defined data types including structures and unions to solve problems 3. Design C programs using pointers and to allocate memory using dynamic memory management and Demonstrate files concept to show input and output of files in C						

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	3										
CO 2	2	3										
CO 3	2	3										

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Programming Methodology** Step involving in problem solving., Problem definition, Algorithm, Characteristics, Notation of Algorithm, Flowcharts- Definition, Symbol, features, Running and debugging the program. Introduction to 'C' History, Character set and keywords, Structure of 'C' programming, constant and its type, Variable and its type (Data types), Operators- Arithmetic, logical, relational, bitwise, increment, decrement, conditional	8
II	**Control Statements and Functions** Conditional control statements- if, if else, nested if, switch, Looping – for statements, nested for, while, do-while statements, Unconditional control statements- break, continue, go to **Functions** Definition, declaration, prototype of function, Local and global variable, User defined function, Storage classes, Pre-processor	8

	Arrays and Pointers Array definition and declaration, Single and multidimensional array, String functions **Pointers** Definition and declaration, Operation on pointer, Pointer initialization, Pointer and function, Pointer and array, Pointer of pointer, Call by value and Call by reference, Dynamic memory allocation	
III	**Structures and Union** Definition and declaration, Array of structures, Passing structure to function, Pointer to structure, Nested structure, self-referential structure, Sizeof and typedef, File Handling Standard input- getchar(), getch(), getche(), Standard output- putchar(), putch(), putche(), Formatted input- scanf(), sscanf(), fscanf(), fread(), Formatted output- printf(), sprintf(), fprintf(), fwrite(), Functions- fseek(), ftell(), fflush(), fclose(), File opening mode- open, modify, write, append, Text and binary mode.	8
Text Books		
1	E Balguruswamy, "Programming with ANSI C", (TMH).	
2	Kernighan and Richie, "The C Programming Language" (PHI)/Pearson Education.	
3	Y.C. Kanetkar, "Let us C".	
Reference Books		
1	Gottfried, "Programming in C", Shattern Series	
2	Herbert Schildt, "Complete 'C' Reference".	

Year, Program, Semester	F.Y , Part I (All Programs) Semester I and II						
Course Code	ESC113/ ESC123						
Course Category	Engineering Science Course						
Course title	**Computer Programming for Engineers (Practical)**						
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Credits**	
	02	-	**02**	04		01	
Evaluation Scheme	**ISE**	**ESE**	**IOE**	**IPE**	**EOE**	**EPE**	**Total**
	30	70	---	**50**	--	--	150
Pre-requisites (if any)	Physics, Mathematics						
Course Objectives	1. Understand the basic terminology used in computer programming 2. Compile and debug programs in C and Implement data structures and algorithms in C						
Course Outcomes	1. Illustrate the flowchart and design of an algorithm for a given problem and to develop C programs using operators Develop conditional and iterative statements to write C programs 2. Design C programs with the use of Pointers to access arrays, strings , functions and Exercise user defined data types including structures and unions to solve problems 3. Design C programs using pointers and to allocate memory using dynamic memory management and Demonstrate files concept to show input and output of files in C						

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3										
CO2	2	3										
CO3	2	3										

Level of Mapping as: Low 1, Moderate 2, High 3

Experiment No.	Experiment Title/Objective	Hours
1	Creation editing, compilation, extension, debugging demonstration with some small program	02
2	Constants, variables and data types declaration with the use of storage classes.	02
3	Use of operators and expressions	02
4	Control statements: if, if-else nested if.	02
5	Control statement: for statement, while statement, do while statement, Use of break, continue, goto statements.	02
6	Use of functions: Prototyping, - Concept of local/ global variables	02
7	Use of pointers: Simple pointers, Operations on pointers, Pointer to arrays, Pointer to Functions	02

8	I/O functions and files handling	
Text Books		
1	E Balguruswamy, “Programming with ANSI C”, (TMH)	
2	Kernighan and Richie, “The C Programming Language” (PHI)/Pearson Education	
3	Y.C. Kanetkar, “Let us C”	
Reference Books		
1	Gottfried, “Programming in C”, Shattern Series	
2	Herbert Schildt, “Complete ‘C’ Reference”.	

Year, Program, Semester	F.Y , Part I (All Programs), Semester I				
Course Code	IKS 111				
Course Category	Indian Knowledge System				
Course title	**Yoga and Meditation**				
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**	**Total Credits**
	01	-	-	01	01
Evaluation Scheme	IE at the course in charge end: (Preferred to have 4 assignments and conduct of an MCQ Test based on the course work. However, the course teacher will declare whether the students have passed it or not. Passing is mandatory to earn the credit.				
Pre-requisites (if any)	Basic physical fitness and flexibility for yoga postures (asanas) and meditation practices. Open-mindedness, willingness to learn, and a commitment to regular practice and self-reflection are essential.				
Course Rationale	This course on yoga and meditation is designed to provide you with a deep understanding and practical experience of these ancient practices. Throughout the course, you will explore various aspects of yoga and meditation, including their history, philosophy, techniques, benefits, and practical applications in everyday life. Each lecture will cover a specific topic, building upon the previous ones to create a comprehensive and well-rounded learning experience				
Course Objectives	1. Gain a comprehensive understanding of yoga and meditation principles and practices for holistic well-being. 2. Develop practical skills to incorporate yoga and meditation into daily life for stress reduction and emotional balance. 3. Explore the scientific basis and applications of yoga and meditation in diverse contexts. 4. Foster personal growth and self-awareness through regular practice, integrating yoga and meditation as a lifelong journey.				
Course Outcomes	1. Develop a strong foundation in yoga and meditation techniques and principles. 2. Cultivate mindfulness and self-awareness through regular practice. 3. Enhance physical flexibility, strength, and overall well-being. 4. Apply yoga and meditation practices to reduce stress and promote mental and emotional balance.				

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1			1	2		3						
CO 2			2	2					2			3
CO 3		3	2						2			
CO 4						3						

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I.	Introduction to Yoga and Meditation: a) Overview of yoga and its origins b) Introduction to meditation techniques and benefits	02
II.	Foundations of Yoga Practice: a) Understanding yoga asanas (poses) and their alignment b) Pranayama techniques for breath control and energy regulation	02
III.	Exploring Meditation Techniques: a) Mindfulness meditation and its practice b) Guided visualization and relaxation techniques	02
IV.	Yoga for Physical Health and Well-being: a) Yoga for flexibility and strength b) Yoga for stress reduction and relaxation	02
V.	Yoga Philosophy and Lifestyle: a) Introduction to the philosophy of yoga b) Applying yoga principles to daily life and relationships	02
VI.	Advanced Practices and Integration: a) Advanced yoga asanas and sequences b) Integrating yoga and meditation into a holistic lifestyle	02

	Reference Books
1.	Iyengar, B.K.S. Light on Yoga: The Bible of Modern Yoga. HarperCollins, 2001.
2.	Khalsa, Gurucharan Singh. Kundalini Yoga: The Flow of Eternal Power. TarcherPerigee, 1999.
3.	Lasater, Judith Hanson. Relax and Renew: Restful Yoga for Stressful Times. Rodmell Press, 2011.
4.	Saraswati, Swami Satyananda. Asana, Pranayama, Mudra, Bandha. Bihar School of Yoga, 2008.
5.	Satchidananda, Swami. The Yoga Sutras of Patanjali. Integral Yoga Publications, 2012.
6.	Zinn, Jon Kabat. Wherever You Go, There You Are: Mindfulness Meditation in Everyday Life. Hyperion, 2005.

	Important web links
1.	Yoga Journal: www.yogajournal.com
2.	Headspace: www.headspace.com
3.	The International Sivananda Yoga Vedanta Centers: **www.sivananda.org**
4.	Insight Timer: www.insighttimer.com

Year, Program, Semester	F.Y, Part I (All Programs) Semester I						
Course Code	HSMEC 111						
Course Category	Humanities and Social Sciences , Management, Environment Courses						
Course title	**Professional Communication (English)- I**						
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Total Credits**	
	02	-	-	02		00	
Evaluation Scheme	**ISE**	**ESE**	**IE**	**IPE**	**EOE**	**EPE**	**Total**
	-		50	----	--	--	50
Pre-requisites(if any)	Students must have the knowledge of basic English grammar, writing and reading skill.						
Course Objectives	1. To help the students to understand the fundamental concepts of Technical communication 2. To acquire the skill of effective use of grammar and vocabulary rules to enhance communication skill 3. To learn fluency in speech and correct pronunciation 4. To learn various techniques of technical writing.						
Course Outcomes	1. The students will understand Basic concepts of communication and Technical communication 2. The students will understand the nuance of phonetics, accent, intonation for improving pronunciation 3. The students will Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar and to identify the common errors in writing and speaking 4. The students will adopt various techniques of oral communication 5. The students will acquires better technical writing techniques**.**						

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1										3		2
CO 2										3		2
CO 3										3		2
CO 4										3		2
CO 5										3		2

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Technical Communication**: communication basics, communication process, verbal and non-verbal Communication, Technical Communication: Features, element of style, distinction between general and technical Communication, Level of communication: Interpersonal, organisation, Mass communication.	4
II	**Introduction to phonetics**: Introduction, phonetic transcription, English pronunciation, guideline to consonant and vowel, word accent, silent and non-silent letter, Common errors in pronunciation, spelling rules words often misspelled.	4

III	**Communicative Grammar and Vocabulary building**: parts of speech, sentence structure, tense, change the voice, Direct and Indirect speech, framing questions Vocabulary: word formation, synonyms and antonyms, Idioms and abbreviation. **Identifying Common Error in writing and speaking English**: Common Errors: Subject–verb agreement, Noun –pronoun agreement, misplaced modifier, Article, prepositions, sequence of tense and identification of tense, word confused, .misused.	6
IV	**Oral communication**: Importance of effective oral communication, introducing oneself and others, oral expressions in various professional contexts, role play, Just A Minute (JAM) activity, speech,	6
V	**Nature and style of Sensible writing**: Importance of effective writing, paragraph writing techniques, document writing, writing introduction and conclusion, proper punctuation, summarization, precise writing, common errors due to Indianism in English communication.	6
Text Books		
1	Meenakshi Raman and Sangita Sharma, "Technical Communication: Principles and Practice", 2nd by Oxford University Press, 2011	
2	J.D.O Connor, "Better English Pronunciation", 2nd by Cambridge University Press, 1980	
3	Wren and Martin, "High School English Grammar and Composition", S Chand and Company Ltd – 2015.	
4	Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press	
5	Meenakshi Raman and Sangita Sharma, "Technical Communication: Principles and Practice", 2nd by Oxford University Press, 2011	
Reference Books		
1	Gajendra Singh Chauhan and Et al, "Technical Communication", Cengage learning India Pvt Limited, 2019.	
2	M Ashraf Rizvi, "Effective Technical Communication", Second Edition by McGraw Hill Education (India) Private	
3	Randolph Quirk and S Greenbaum ,"A University Grammar of English Latest", Pearson 2007	
4	Sanjay Kumar and Pushplata Communication Skills" , Oxford University Press India Pvt Ltd - 2019	
5	Practical English Usage by Michael Swan, Oxford University Press – 2016	
6	D Praveen Sam, KN Shoba, "A Course in Technical English", Cambridge University Press – 2020.	
Useful web links		
1	**https://learnenglish.britishcouncil.org**	
2	**https://www.fluentu.com**	

Year, Program, Semester	F.Y. Part I (All Programs), Semester I				
Course Code	VSEC111				
Course Category	Vocational and Skill Enhancement Courses				
Course title	**Design Thinking and Innovation-I**				
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**	**Total Credits**
	01	01	-	02	00
Evaluation Scheme	IE at the course in charge end: (Preferred to have 3-5 assignments and conduct of an MCQ Test based on the course work. However to declare whether the students has passed it or not. Passing is mandatory.				
Pre-requisites (if any)	Prerequisites for this course include a basic knowledge of design thinking principles to engage with the course content effectively. Familiarity with social issues and community engagement is beneficial, as the course focuses on applying design thinking to address social challenges. Strong communication and collaboration skills are essential for successful interdisciplinary teamwork and engaging with diverse stakeholders				
Course Rationale	The purpose of engineering education has to be to transform these graduates who can design. The concept of design or design thinking though complex, it is the robust and it must be developed among the budding graduates so as to make them not alone job seekers but the providers too. Therefore, the particular course is towards preparing engineering graduates as intended to be versatile of all other professionals.				
Course Objectives	1. Develop a solid foundation in design thinking for user-centered problem-solving and engineering innovation. 2. Enhance ideation, prototyping, and iteration skills to generate creative solutions that effectively address user needs and preferences. 3. Analyze and optimize design alternatives based on user feedback, ensuring continuous improvement and alignment with engineering requirements. 4. Incorporate systems thinking, human factors, sustainability, and ethics into engineering design for socially responsible and user-centric solutions.				
Course Outcomes	1. Apply design thinking principles to identify user needs, analyze engineering challenges, and generate innovative solutions. 2. Demonstrate proficiency in ideation, prototyping, and iterative design techniques to develop user-centered engineering solutions. 3. Evaluate and enhance design alternatives based on user feedback, ensuring alignment with engineering requirements. 4. Integrate systems thinking, human factors, sustainability, and ethics into engineering design for responsible and user-centric solutions.				

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1			1	2		3						
CO 2			2	2					2			3
CO 3		3	2						2			
CO 4						3	3	2				

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours L+T
I.	**Introduction to Design Thinking:** a) Principles and process of design thinking, user-centered design, and ideation techniques. b) User research skills, rapid prototyping, and testing for iterative design. c) Cultivating a culture of innovation, applying design thinking to engineering problems, and teamwork.	06+06
II.	**Design Thinking in Engineering Practice:** a) Applying design thinking to engineering challenges, empathy-driven design, and systems thinking. b) Analyzing and evaluating design alternatives, iterative design, and continuous improvement. c) Human factors and ergonomics, sustainability and ethics in design, and effective communication.	06+06

During the tutorial session itself for first 6 sessions, the course facilitator will complete these three sub units interactively while remaining 6 sessions will be free for the students to have the activities for which the following general guidelines to be followed:

General Instructions for course facilitators:

The facilitators may use different student centric teaching learning methods to make the course content more and interesting and meaningful. Some of the following activities may be planned

a) Brain teasers (aka Puzzle Busters, to be solved individually)
b) Cartoon captions (small teams)
c) TRIZ, a systematic ideation method, reading (individual)
d) Book readings and discussions (small teams)
e) Small teams' presentations on innovation:(1) innovative individual, (2) innovative company, (3) innovative movie / game, (4) sustainable innovation, (5) innovation in business, (6) innovation in art, (7) innovation in architecture, (8) innovative nation, (9) innovation in science, and (10) innovation in engineering.
f) Large groups hands-on projects
g) Eight-dimensional (8D) ideation method examples
h) Large teams' videos.
i) Students also will be taken to the **workshop** to experience some kind of hands on training to make carpentry, metal or smithy job.

Reference Books

1.	Lockwood, T., & Papke, E. (2010). Design Thinking: Integrating Innovation, Customer Experience, and Brand Value. Allworth Press.
2.	Lewrick, M., Link, P., & Leifer, L. (2018). The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems. Wiley.
3.	Plattner, H., Meinel, C., & Leifer, L. (Eds.). (2020). Design Thinking Research: Building Innovation Eco-Systems (Understanding Innovation). Springer.
4.	Brown, T. (2009). Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation. Harper Business.
5.	Ramanathan, U., & Seth, R. (Eds.). (2018). Social Internship and Sustainable Community Development in India: Concepts, Strategies, and Best Practices. Springer.
Sr. No.	**Important web links**
1.	Stanford d.school - https://dschool.stanford.edu/
2.	IDEO U - https://www.ideou.com/

Social Internship: After the First Semester of FY B. Tech the students will undergo social rural internship of 10 days, the evaluation of which will be in the Second Semester.

The class teacher jointly with the Program Head and First Year Coordinator will plan for this activity. The following tasks to be thought of before the students proceed for the said social internship and accordingly the students will be guided to complete this internship preferably in a rural part of the state.

a) Introduction to social internship projects and objectives.
b) Assignment of social internship teams and project topics.
c) Guidance on project planning and community engagement strategies.

Year, Program, Semester	F.Y, Part I (All Programs), Semester I and II						
Course Code	BSC111/ BSC121						
Course Category	Basic Science Course						
Course title	**Engineering Chemistry (Theory)**						
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Total Credits**	
	03	-	02	05		04	
Evaluation Scheme	**ISE**	**ESE**	**IOE**	**IPE**	**EOE**	**EPE**	**Total**
	30	70	---	50	--	--	150
Pre-requisites(if any)	Knowledge about basic chemistry related to periodic table, properties of elements, physical and chemical properties, etc.						
Course Objectives	1. To enable the students to understand and apply detailed concepts of water source, water impurities, hardness of water and boiler troubles. 2. To enable the students to analyze engineering problems related to metal corrosion and achieving practical solutions for corrosion control. 3. To enrich students with the concepts related to engineering materials like cement, polymers and composites, and meet out the fuel crises in the present scenario for sustainable development. 4. To enable the students to apply principles of green chemistry in chemical synthesis and understand the concepts of synthesis of nanomaterials. 5. To impart the knowledge of basic principles and applications of spectroscopic and other techniques to analyse the compounds.						
Course Outcomes	Students will be able to: 1. Develop understanding of water quality parameters and incorporate methods to produce soft water for industrial and domestic use. 2. Analyze engineering problems associated with corrosion and develop suitable preventive measures. 3. Select the appropriate materials for engineering applications. 4. Recognize the current developments in the fields of energy, green chemistry and nanotechnology for sustainable development. 5. Apply and demonstrate the instrumental techniques for analysis of the materials						

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2										
CO 2	3	2										
CO 3	3	2										
CO 4	3	2					2					
CO 5	3	2			2							

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Water Technology** Introduction, Impurities in water, Water Quality Parameters (Definition, Causes and Estimation) like Hardness, Chlorides, Dissolved Oxygen (DO), Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD), Specifications for drinking water, Boiler feed water, Problems associated with use of hard water in boiler, Treatment of water: Ion Exchange Process and Reverse Osmosis.	6
II	**Corrosion and Corrosion Control** Introduction, Types of corrosion, Atmospheric corrosion, Corrosion due to oxygen and other gases, Electrochemical corrosion, Mechanism of electrochemical corrosion (Hydrogen Evolution and Oxygen Absorption), Galvanic Series, Factors influencing rate of corrosion, Corrosion control methods- Proper selection of material, Cathodic protection (sacrificial anode and impressed current methods), Metallic coating like Hot dipping (Galvanizing and Tinning), Metal cladding, Spraying and Electroplating.	6
III	**Engineering Materials** **Cement:** Introduction, Types, Composition of Portland Cement, Setting and Hardening of Cement **Polymers:** Introduction, Classification, Commercially important polymers with synthesis and applications: PE, PVC, Teflon, Nylon, Bakelite and Silicon Polymers, Biodegradable polymers. **Conducting polymers:** Introduction, Mechanism of conduction in poly acetylene and its applications. **Composites:** Introduction, Constitution, Types: Fiber reinforced composites and Particulate composites, applications.	6
IV	**Green Chemistry** Introduction, 12 principles of green chemistry, Various green chemical approaches Microwave synthesis, Phase transfer catalysis, Synthesis of Adipic acid by conventional and Green route. **Nanomaterials** Introduction, Synthesis of nanomaterials: Top down and bottom up approaches, characteristics of nanomaterials and applications of nanomaterials, Carbon Nano tubes (properties and applications).	8
V	**Modern Analytical Techniques** Chemical Analysis, Qualitative and quantitative analysis, Conventional methods of analysis, An overview of modern analytical techniques: Chromatography, Scanning Electron Microscopy (SEM), X-ray Diffraction (XRD), Spectroscopy: Principle, Basic Instrumentation and Applications of Ultraviolet-Visible Spectroscopy and IR spectroscopy.	7
VI	**Fuels and Batteries** **Chemical Fuels:** Introduction, Calorific value, Determination of calorific value by Bomb and Boy's Calorimeters, Combustion. **Batteries:** Introduction, Classification, characteristics, construction, working and applications of Li-ion battery. **Fuel Cells:** Components of fuel cell, Types of Fuel cells-alkaline fuel cells, Methanol-oxygen fuel cell and Hydrogen-oxygen fuel cell. **Bioenergy:** Introduction, Classification of biofuel, Biodiesel- production of biodiesel by alkali catalyzed trans-esterification method, Advantages and disadvantages of biodiesel.	6

Text Books	
1	Satyaprakash & Manisha Agrawal, “Engineering Chemistry”, Khanna Book Publishing, Delhi
2	Shashi Chawla, “A Text Book of Engineering Chemistry”, Dhanpat Rai and Co. (P) Ltd.
3	Bahl and Tuli, “Essentials of Physical Chemistry”, S. Chand Publishing
4	Baskar, “Engineering Chemistry”, Wiley
5	Jain and Jain, “A textbook of Engineering Chemistry”, Dhanpatrai Publication.
6	S. S. Dara, S. “A textbook of Engineering”, Chemistry: Chand Publication
Reference Books	
1	V.R. Gowariker, “Polymer Science”, New Age International Publication
2	K. J. Sundars, “Organic Polymer Chemistry”, Springer Publication.
3	Willard Dean, Merrittee, “Instrumental Methods of Chemical Analysis”, Tata MacGrow Hill Limited.
4	Chatwal and Anand, “Instrumental Methods of Chemical Analysis”, Himalaya Publishing House, New Delhi.
5	V.R. Gowariker, “Polymer Science”, New Age International Publication

Year, Program, Semester	F.Y, Part I (All Programs) Semester I and II						
Course Code	BSC111/ BSC121						
Course Category	Basic Science Course						
Course title	**Engineering Chemistry (Practical)**						
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Credits**	
	03	-	**02**	05		01	
Evaluation Scheme	**ISE**	**ESE**	**IOE**	**IPE**	**EOE**	**EPE**	**Total**
	30	70	---	**50**	--	--	150
Pre-requisites (if any)	Knowledge about basic chemistry related to periodic table, properties of elements and handling of glass wares and chemicals etc.						
Course Objectives	1. To impart the knowledge of independent experimental skills and to develop analytical skills for applications in engineering. 2. To provide hands on practice of titrimetric analysis. 3. To analyze various samples by using instrumental methods.						
Course Outcomes	After successful completion of this course, the student will able to: 1. Apply basic concepts of chemistry and select the appropriate method for chemical analysis. 2. Analyze the quality of water by determining its quality parameters. 3. Acquire the skill for the preparation of engineering materials like polymers, nanomaterials. 4. Select instrumental techniques for chemical analysis						

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12
CO1	3	2										
CO2	3	3				2						
CO3	3											
CO4	3	3										

Level of Mapping as: Low 1, Moderate 2, High 3

Experiment No.	Experiment Title/Objective	Hours
1.	Preparation of standard solution and standardization of a given solution.	02
2.	Determination of total hardness of a water sample using disodium salt.	02
3.	Determination of chloride content of water sample.	02
4.	Determination of alkalinity of water sample by duel indicator method.	02
5.	Determination of viscosity of a given liquid by Ostwald's viscometer	02
6.	Preparation of Polymers (phenol formaldehyde resin/ urea formaldehyde resin)	02
7.	Preparation of chemical compounds using green route.	02

8.	Preparation of nanomaterials.	02
9.	Estimation of rate of corrosion of aluminium in acidic and alkaline medium.	02
10.	Estimation of copper in the given brass solution.	02
11.	Spectrometric/colorimetric determination of concentration of given inorganic sample.	02
12.	Calibration of pH meter and determination of pH of a solution.	02
13.	Demonstration of TLC/paper chromatography.	02
* Instructor may choose any 8-10 experiments from above.		
Text Books		
1	Vogel's Text Book of Quantitative Chemical Analysis revised by G. H. Jeffery, J. Bassett, J. Mendham and R.C. Denny, 4th Edition.	
2	Willard, Merit, Dean and Settle, A text book of Instrumental analysis, 10th edition 2020.	
Reference Books		
1.	A. I. Vogel, Quantitative Chemical Analysis, Longman Publication	
2.	B. K. Sharma, Instrumental Methods of Chemical Analysis, Goel Publication, Meerut.	
3.	Renu Bapna and Renu Gupta, Engineering Chemistry, MacMillan Publishers (India) Ltd, Delhi	
4.	D. A. Skoog, D. M. West, Fundamentals of Analytical Chemistry, Cengage Learning.	

Year, Program, Semester	F.Y , Part I (All Programs) Semester I and II						
Course Code	ESC111/ ESC121						
Course Category	Engineering Science Course						
Course title	**Elements of Civil and Electrical Engineering (Theory)**						
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Total Credits**	
	04	-	02	06		05	
Evaluation Scheme	**ISE**	**ESE**	**IOE**	**IPE**	**EOE**	**EPE**	**Total**
	30	70	--	50	--	--	150
Pre-requisites (if any)	--						
Course Rationale	This course is to provide students with a strong foundation in the fundamental principles and concepts of civil and electrical engineering. This foundational knowledge is essential for understanding and applying advanced concepts in specialized areas of engineering.						
Course Objectives	1. To inculcate essentials of civil engineering field to the students of all branches of Engineering. 2. To provide the students an illustration of the significance of Civil Engineering profession in satisfying societal need. 3. To introduce fundamental laws, various concepts and theorems related with electrical Engineering 4. To provide fundamental knowledge about AC, DC and magnetic circuits						
Course Outcomes	1. Understand fundamental aspects of civil engineering 2. Determine the plan and set out a building. 3. Apply types of traversing for calculations of the included angle. 4. Apply methods of levelling for calculation of reduce levels of different points on the surface of the earth. 5. Understand use of various building materials and explain the method of construction of different components of building and building services. 6. Understand the basic concepts of Electrical and Magnetic circuits. 7. Apply and analyze the resistive circuits using star-delta conversion, KVL and KCL under DC supply 8. Understand the basics of single phase and Three phase circuit						

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	3										
CO 2	2	3										
CO 3	3	2										
CO 4	2	3										
CO 5	2	3										
CO 6	3	3										
CO 7	3	3										
CO 8	2	3										

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Introduction to Civil engineering and Modern surveying** Introduction to civil engineering, various disciplines of civil engineering, relevance of civil engineering in overall infrastructural development of the country, Introduction to types of buildings as per National Building Code, Components of residential building and their functions **Surveying:** Principle and objectives of surveying. Linear measurement: Instrument used, tapes, types of tapes. Angular measurement: Instrument used, meridian, bearing. Problems based on open and closed traversing. **Levelling:** Instrument used, Terminology, Types of leveling, and Methods of leveling, Introduction to contour. **Modern surveying:** Introduction to total station and electronic distance meter	10
II	**Building planning and services** Introduction to planning of residential building, site plan, orientation of building, open space requirement, FSI, position of doors and windows, size of room, building bye laws. Introduction to various building area terms: Computation of plinth area/built up area, floor area/carpet area for a single storey building. Basic infrastructure and services - Elevators, escalators, ramps, air conditioning, towers, chimney and water tank, concept of intelligent buildings.	5
III	**Building construction materials** Brick and cement block – properties and specifications Cement – OPC properties, grades and others types of cement and its uses. Cement mortar – constituents and preparations Concrete – PCC and RCC Steel – Uses of steel in building construction, types and market forms.	5
IV	**DC Networks :** Concepts of linear, nonlinear, active, passive, unilateral and bilateral elements; Ideal and practical voltage & current sources, conversion from one from the other; Kirchhoff's laws, statements; Mesh Analysis; Nodal Analysis; Delta-Star & Star-Delta conversion; and its application. **Magnetic circuits:** Magnetic effect of an electric current, Concept of mmf, flux, flux density, reluctance, permeability and field strength, their units and relationships. Simple series magnetic circuit , comparison of electric and magnetic circuit, force on current carrying conductor placed in magnetic field, Fleming's left hand rule. Faradays laws of electromagnetic induction.	7
V	**AC Fundamentals** Sinusoidal voltages and currents, their mathematical and graphical representation, Concept of cycle, Period, frequency, instantaneous, peak(maximum), average and r.m.s. values, peak factor and form factor. Phase difference, lagging, leading and in phase quantities	6
VI	**Single Phase AC Circuits** Study of AC circuits consisting of pure resistance, pure inductance, pure capacitance, series R-L, R-C and R-L-C circuits, phasor diagrams, voltage, current and power waveforms, concept of impedance, concept of active, reactive, apparent power and power factor.	7
Text Books		
1	S. S. Bhavikattis, "Basic Civil Engineering", New Age International Pvt. Ltd	
2	G.K.Hiraskar, "Basic Civil Engineering", Dhanapat Rai Publications	

3	V. N. Mittal and Arvind Mittal "Basic Electrical Engineering" Tata McGraw Hill,(Revised Edition)
4	B.L. Theraja ,"Electrical Engineering " Vol-I and II
5	V.K.Mehta, " Fundamentals of Electrical Technology",S.Chand Publications
Reference Books	
1	Gopi. S., Basic civil engineering Person publishers
2	Kandya A. A., Elements of civil engineering, Charotar publishing house
3	McKay, W. B. and McKay J. K. Building construction Volume I to IV, Person India education services
4	Rangwala S. C., Essentials of civil engineering, Charotar publishing house
	Rangwala S. C. and Dalal K. B. Building construction, Charotar publishing house
5	L. S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press, 2011.
6	D. C. Kulshreshtha, Basic Electrical Engineering, McGraw Hill, 2009.
Useful web links	
1	**https://www.youtube.com/watch?v=SvE3NGfIrJ4&list=PLEtCpM3x4BD8iVQLMyXNCTcXP6dl-SDBz&index=1**
2	**https://www.youtube.com/watch?v=2eKR8b7q8K4&list=PLkEhI-YDhJ6xN7lsr6rc7d5awH5WTmpxG**
3	**http://nptel.ac.in/courses/105107122/**
4	**https://nptel.ac.in/courses/105104100**
5	**https://www.digimat.in/nptel/courses/video/108105112/L01.html**
6	**https://nptel.ac.in/courses/108105053**

Year, Program, Semester	F.Y, Part I (All Programs) Semester I and II						
Course Code	ESC111/ ESC121						
Course Category	Engineering Science Course						
Course title	**Elements of Civil and Electrical Engineering (Practical)**						
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Credits**	
	04	-	**02**	06		**01**	
Evaluation Scheme	**ISE**	**ESE**	**IOE**	**IPE**	**EOE**	**EPE**	**Total**
	30	70	--	**50**	--	--	150
Pre-requisites (if any)	--						
Course Rationale	This course is to provide students with a strong foundation in the fundamental principles and concepts of civil and Electrical engineering. This foundational knowledge is essential for understanding and applying advanced concepts in specialized areas of engineering.						
Course Objectives	1. To learn methods of surveying for the preparation of plan. 2. To identify components of buildings, materials used in the construction. 3. To expose the students for practical training through experiments to understand about fundamental parameters such as resistance, inductance, capacitance and magnetic, AC and DC circuits. 4. To make them understand electrical safety precautions						
Course Outcomes	1. Experiment to plot the outline of building 2. Establish surveying and levelling instruments for finding included angles and reduce levels 3. Explain the components of different types of construction 4. To conduct experiments on D.C. circuits and AC circuits. 5. To understand the basics laws of magnetic circuit						

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3										
CO2	2	3										
CO3	2	3										
CO4	3	2										
CO5	3	3										

Level of Mapping as: Low 1, Moderate 2, High 3

Experiment No.	Experiment Title/Objective	Hours
1	Plotting the outline of building by measuring tape	02
2	Plotting of closed traverse by Prismatic compass and Surveyor Compass.	02
3	Determination of Reduced Levels by using dumpy level (Use of Collimation Plane and Rise and Fall method)	02
4	Use of Total Station to measure angle, R.L., elevation.(Demonstration)	02
5	Field visit showing various types of construction and prepare field visit report.	02
6	Study the verification of Kirchhoff's law and Ohm's Law	02
7	Transient analysis of series RL and RC circuit	02
8	Study of BH curve for magnetic material	02
9	Study of series RLC circuit	02
10	Study of various power factor improving methods	
Text Books		
1	S. S. Bhavikattis, "Basic Civil Engineering", New Age International Pvt. Ltd	
2	G.K.Hiraskar, "Basic Civil Engineering", Dhanapat Rai Publications	
3	Fundamentals of Electrical Engineering by Ashfaq Husain, Dhanpat Rai Company	
Reference Books		
1	B.C. Punmia, "Surveying", Vol.- I, Vol.-II, Vol.-III, Laxmi Publication	
2	K.R.Arora, " Surveying Vol.I", Standard Book House	
3	L. S. Bobrow, ―Fundamentals of Electrical Engineering, Oxford University Press, 2011	

Year, Program, Semester	F.Y, Part I (All Programs) Semester I and II						
Course Code	ESC112/ ESC122						
Course Category	Engineering Science Course						
Course title	**Engineering Graphics (Theory)**						
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Total Credits**	
	03	-	02	05		04	
Evaluation Scheme	**ISE**	**ESE**	**IOE**	**IPE**	**EOE**	**EPE**	**Total**
	30	70	--	50	--	--	150
Pre-requisites(if any)	Knowledge of plane geometry and solid geometry						
Course Objectives	1. The course is aimed at developing Basic Graphic skills. 2. To learn the engineering graphics standards. 3. To develop Skills in Reading and Interpretation of Engineering Drawings. 4. To introduce Computer-Aided Drafting tools						
Course Outcomes	1. Identify basic concepts of BIS conventions and their application. 2. Interpret first angle and third angle projection system. 3. Construct orthographic projections of points, lines and planes. 4. Apply principles of projection and construct orthographic and isometric views of an object. 5. Develop a skill of visualization to understand and read the drawing.						

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	2	2	1		1		3		
CO 2	3	3	3	2	2	1				1		
CO 3	3	3	3	2	2	1				1		
CO 4	3	3	3	2	2					2		
CO 5	3	3	3	2	2				2	2		

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Introduction to Engineering Drawing** Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections, Cycloid, Involutes.	6
II	**Orthographic Projections of Points, lines & Planes** Principles of Orthographic Projection - Conventions; Projection of Points and lines inclined to both planes (line in first quadrant only). Projection of planes – inclined Planes and auxiliary Planes.	7
III	**Projections of Regular Solids.** Projection of Prisms, Pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes, solids in first quadrant and resting on HP only.	6
IV	**Orthographic Projections** Different types of lines, Selection of views, spacing of views, dimensioning and sections, Conversion of pictorial view into orthographic view including sectional orthographic view.	8

V	**Isometric projections** Principles of Isometric Projection, Isometric scale, Isometric projections and Isometric views / drawings. Circles in isometric view. Isometric views of simple solids and objects.	6
VI	**Introduction to Computer Aided Sketching** Introduction to CAD software, Graphical User interface of CAD software, Selection of Drawing size and scale, Standard Toolbars, Menus, Tabs, navigational tools, Basic Commands to draw 2D objects, Co-ordinate system and planes, Viewing Commands.	6

***Note:** The above syllabus is to be covered according to the first angle method of projection.

Text Books

1.	Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House.
2.	Engineering Drawing and Graphics by K. Venugopal, New Age Publication.
3.	P. S. Gill, Engineering Drawing, S. K. Katariya & sons Publication.

Reference Books

1.	Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
2.	Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, SciTech Publishers
3.	Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4.	Jain, Maheshwari, Gautam (2021), Engineering Graphics & Design, Khanna Book Publishing.

Alternative NPTEL/SWAYAM Course

Sr. No.	NPTEL Course Name	Instructor	Host Institute
1.	Prof. Rajaram Lakkaraju	IIT Kharagpur	Engineering Drawing And Computer Graphics
2.	Prof. Nihar Ranjan Patra	IIT Kanpur	Engineering Graphics

Useful web links

1.	**https://nptel.ac.in/courses/112103019/** **National Programme on Technology Enhanced Learning (NPTEL) - Phase II** **Course Name : Engineering Drawing**
2.	**https://nptel.ac.in/courses/112/104/112104172/**
3.	**http://moodle.unishivaji.ac.in/course/search.php?search=engineering+graphics** **Moodle Services, Shivaji University, Kolhapur**
4.	**http://web.iitd.ac.in/~achawla/public_html/201/lectures/sp46.pdf**

Year, Program, Semester	F.Y, Part I (All Programs) Semester I and II						
Course Code	ESC112/ ESC122						
Course Category	Engineering Science Course						
Course title	**Engineering Graphics (Practical)**						
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Credits**	
	03	-	**02**	05		**01**	
Evaluation Scheme	**ISE**	**ESE**	**IOE**	**IPE**	**EOE**	**EPE**	**Total**
	30	70	---	**50**	--	--	150
Pre-requisites(if any)	Knowledge of plane geometry and solid geometry						
Course Objectives	1. Fundamental Engineering Graphics standards 2. Dimensioning and preparation of neat drawings. 3. Reading and Interpretation of Engineering Drawings. 4. Exposure to Computer-Aided Drafting tools						
Course Outcomes	1. Identify and implement B.I.S. code of practice for Engineering Drawing. 2. Create geometrical constructions with hand tools. 3. Construct orthographic projection and sectional view of a machine part. 4. Create isometric projection from multiview drawings of an object. 5. Sketch projection of solids and development of lateral surfaces of solids.						

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12
CO 1	3	3	3	2	2	1		1		3		
CO 2	3	3	3	2	2	1				1		
CO 3	3	3	3	2	2	1				1		
CO 4	3	3	3	2	2					2		
CO 5	3	3	3	2	2				2	2		

Level of Mapping as: Low 1, Moderate 2, High 3

Experiment No.	Experiment Title/Objective	Hours
1	Lettering and geometrical constructions	02
2	Engineering curves	02
3	Projections of Points and lines	02
4	Projections of planes	02
5	Projections of solids	02
6	Development of lateral surfaces of solids	02
7	Orthographic projections	02
8	Isometric projections	02
9	Demonstration of drafting software with commands	02
All these sheets should be drawn on half imperial (A2 size) drawing sheets only		
Text Books		
1.	Bhatt N. D., Panchal V. M. & Ingle P. R., (2014), Engineering Drawing, Charotar Publishing House	
2.	Engineering Drawing and Graphics by K. Venugopal, New Age Publication	
3.	P. S. Gill, Engineering Drawing, S. K. Katariya & sons Publication.	
Reference Books Or Web links		
1.	Engineering Drawing Practice for Schools and Colleges- BUREAU OF INDIAN STANDARDS	
2.	Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education	
3.	CAD Software Theory and User Manuals	
4.	**http://web.iitd.ac.in/~achawla/public_html/201/lectures/sp46.pdf**	
5.	**https://nptel.ac.in/courses/112/104/112104172/**	

Year, Program, Semester	F.Y, Part I (All Programs) Semester I and II						
Course Code	ESC113/ ESC123						
Course Category	Engineering Science Course						
Course title	**Electrical-Electronic Components and Devices (Theory)**						
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Total Credits**	
	02	-	02	04		03	
Evaluation Scheme	**ISE**	**ESE**	**IOE**	**IPE**	**EOE**	**EPE**	**Total**
	30	70	--	50	--	--	150
Pre-requisites(if any)	Knowledge of Basic Physics and Mathematics ,electron theory, electricity, potential and kinetic energy						
Course Rationale	The course offers practical knowledge and skills for understanding and applying various instruments, devices, and systems in real-world scenarios. Studying this course enhances technical competence, critical thinking, problem-solving abilities, and adaptability to evolving technologies in electrical engineering.						
Course Objectives	The course is aimed at 1. Developing the fundamental understanding of DC and AC Machine 2. Developing the awareness about Green energy & Power system 3. Developing the fundamental understanding of various electronics components 4. Developing the fundamental understanding of Number systems and logic gates						
Course Outcomes	Upon completion of this course, student should be able to 1. Recognise The concept of DC machine and AC machines 2. Understand the basics of power systems 3. Understand the basics of electrical safety rules 4. Recognise the basics of electronic components and their practical use 5. Understand the basics of logic gates and number systems						

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	3										
CO 2	2	3										
CO 3	3	2										
CO 4	3	2										
CO 5	2	3										

Level of Mapping as: Low 1, Moderate 2, High

Unit No.	Course Content	Hours
I	**DC Machine** **DC Generator:** Working principle of DC machine as generator and motor, constructional features, EMF equation of generator, types of DC generators **DC Motor:** Back EMF and its significance, types of DC motors, numerical problems, Applications of DC Motors	4
II	**AC Machines** **Induction motors**: Concept of rotating magnetic field, principle of operation, types and constructional features, Slip and its significance, Illustrative examples **Transformers:** Principle of operation and construction of single phase transformers (core and shell type), EMF equation, power losses, efficiency, illustrative problems on EMF equation.	4
III	**Basics of Power systems** Introduction**,** Single Line Diagram of AC Power Transmission System Safety & Protection**:** Electric **s**hock & Precautions, HRC Fuse, circuit breaker & its types Earthling: necessity.	4
IV	**Resistors** Concept of resistors, classification, specification: - maximum power rating, tolerance. Construction of carbon film, wire wound resistors, potentiometer, LDR. Color coding.	4
V	**Capacitors and Inductors** Classification of capacitors, specification, Fixed capacitor - construction, specification and application of disc, ceramic capacitor, aluminium electrolytic capacitor. Variable capacitor- Trimmer capacitor. **Inductor :** construction and application of air core, iron core, ferrite core inductor	4
VI	**Number Systems:** Binary Number System, Hexadecimal Number System, octal number system , inert conversion of number systems **Logic gates:** NOT Gate, AND Gate, OR Gate, XOR Gate, NAND Gate, NOR Gate, X-NOR Gate	4

Text Books

1.	V. N. Mittal and Arvind Mittal "Basic Electrical Engineering" Tata McGraw Hill,(Revised Edition)
2.	D P Kothari and I J Nagrath "Theory and Problems of Basic Electrical Engineering", PHI 13th edition 2011.
	Robert Boylestad ,Louis Nashelsky, Electronic Devices and Circuits,Pearson,11th edition,2015
3.	R.P.Jain**,**"Modern Digital Electronics", Tata McGraw Hill,4th edition 2009

Reference Books

1.	Edward Hughes: Electrical and Electrical Technology, Pearson Education (Tenth edition)
2.	Electrical Technology By H.Cotton.
3.	Allen Mottershead. (PHI)"Electronics Devices & Circuits".
4.	Thomas L. Floyd"Electronics Devices"

Alternative NPTEL/SWAYAM Course

Sr. No.	NPTEL Course Name	Instructor	Host Institute
1.	Basic Electrical Technology	Prof. N.K.De, Prof. G.D.Roy	IIT Khargpur
2.	Fundamentals of Electrical Engineering	Prof. Debapriya Das	IIT Khargpur

Useful web links	
1.	**https://archive.nptel.ac.in/courses/108/105/108105112/**
2.	**https://nptel.ac.in/courses/108105112**
3.	**https://www.digimat.in/nptel/courses/video/108108076/L01.html**
4.	**https://www.digimat.in/nptel/courses/video/108108076/L34.html**

Year, Program, Semester	F.Y, Part I (All Programs) Semester I and II						
Course Code	ESC113/ ESC123						
Course Category	Engineering Science Course						
Course title	**Electrical-Electronic Components and Devices (Practical)**						
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Credits**	
	02	--	**02**	04		**01**	
Evaluation Scheme	**ISE**	**ESE**	**IOE**	**IPE**	**EOE**	**EPE**	**Total**
	30	70	--	**50**	--	--	150
Pre-requisites(if any)	--						
Course Rationale	This course aims to give a practical understanding of electrical engineering applications in day to day life.						
Course Objectives	The course is aimed at 1. To make the students familiar with suitability of various electronics components and transducers for different application 2. To Impart Knowledge about basics of Semiconductor Devices and its parameters 3. To impart knowledge of the concepts of transformer, different energy conversions machines 4. To make them understand electrical safety precautions						
Course Outcomes	Upon completion of this course, student should be able to 1. Understand the basics of Electronics component 2. Identify and explain the Basic gates. 3. Understand the applications of various rotating machines 4. Study the speed control methods for DC motor						

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12
CO1	2	3										
CO2	2	3										
CO3	2	3										
CO4	3	2										

Level of Mapping as: Low 1, Moderate 2, High 3

Experiment No.	Experiment Title/Objective	Hours
1	To study of speed control methods of DC Shunt motors	02
2	To study of speed control methods of DC Series motors	02
3	To study of DC and AC motor Starters	02
4	Study of various wiring systems and switchgear	02
5	To demonstrate different types of electrical protection equipment such as fuses, MCB, MCCB, ELCB.	02
6	Testing of electronics components- Resister, capacitor, inductor diode ,Transistor ,LED and switch using multi-meter and CRO	02
7	Logic gates and truth table verification.	02
8	To study safety precautions while working on electrical systems, handling of various equipment's such as multimeter, ammeters, voltmeters, wattmeter's, real life resistors, inductors and capacitors	02
All these sheets should be drawn on half imperial (A2 size) drawing sheets only		
Text Books		
1.	Ashfaq Husain,"Fundamentals of Electrical Engineering", Dhanpat Rai Company	
Reference Books		
1.	L. S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press, 2011	
2.	D.C. Kulshreshtha, Basic Electrical Engineering, McGraw Hill, 2009	

Year, Program, Semester	F.Y, Part I (All Programs) Semester II							
Course Code	BSC122							
Course Category	Basic Science Course							
Course title	**Engineering Mathematics-II (Integral Calculus) (Theory)**							
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**			**Total Credits**	
	03	01	-	04			04	
Evaluation Scheme	**ISE**	**ESE**	**IOE**	**IPE**	**EOE**	**EPE**	**Total**	
	30	70	50	--	--	--	150	
Pre-requisites(if any)	Differential Calculus, Basics of Integration.							
Course Objectives	1. To familiarize the students with integral calculus. 2. To teach Mathematical methodologies and models. 3. To develop mathematical skills and enhance logical thinking power of students. 4. To provide students with skills in special functions, integral calculus, complex integration which would enable them to devise engineering solutions for given situations they may encounter in their profession.							
Course Outcomes	1. To understand the concept of special functions and curve tracing related to multiple integral and various branches of engineering. 2. To understand how to solve double and triple integrals 3. Apply the knowledge of evaluation of multiple integral to various engineering problems. 4. Evaluation and analysis of complex integration. 5. Understand the features of the Matlab software and its applications.							

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2										
CO 2	3	3										
CO 3	3	2										
CO 4	3	2										
CO 5	3	3										

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Special Functions** Gamma functions and their properties, Beta functions and their properties, Differentiation under integral sign.	7
II	**Curve Tracing** Tracing of curves in Cartesian coordinate system (Simple curves, Semi cubical parabola, Cissoid of Diocles, Strophoid, Astroid, Witch of Agnesi and Common Catenary), Tracing of curves in Polar coordinate system (Simple curves, Cardioid, Pascal's Limacon, Lemniscate of Bernoulli and Rose curves)	6
III	**Multiple Integrals** Introduction of Double Integrals, Evaluation of Double Integrals, Change of order of Integration, Change of variables using Jacobians, Change into Polar coordinates, Evaluation of Triple Integral with given limits.	7
IV	**Applications of Multiple Integrals** Applications of Multiple Integrals to Area enclosed by plane curves, Mass of a Plane Lamina, Moment of Inertia of a plane lamina and Volume of solid of revolution.	7
V	**Functions of Complex Variables: Integration** Complex line integrals, Cauchy's integral theorem (without proof), Cauchy's integral formula (without proof), Taylor series, Laurent series, zeros of analytic functions, singularities, and Cauchy's Residue theorem (without proof).	7
VI	**Programming with Matlab** Introduction, Installation, Basic functions of Matlab, Plotting of 2D and 3D Curves, Finding Indefinite Integral, Finding Definite Integral, Plotting of Complex function, Complex Line Integrals.	6
	<u>Suggested list of Tutorials and Assignments-</u> 1. Gamma function 2. Beta function 3. Curve tracing 4. Double and Triple Integration 5. Change of order of Integration 6. Change of variables using Jacobians 7. Applications of Multiple integrals 8. Cauchy's Integral theorem and Cauchy's integral formula 9. Taylor series and Laurent series 10. Cauchy's Residue theorem **General Instructions:** 4. Each Student has to write at least 6 assignments on entire syllabus and at least 4 assignments on Matlab programming (including print out). Students must be encouraged to write mathematical programs in tutorial class only. 5. Batch wise tutorials are to be conducted. The number of students per batch should be as per the practical batches. 6. Matlab assignments will be based on 1. Tracing of 2D and 3D Curves 2. Finding Indefinite and Definite Integrals 3. Double and triple integral 4. Plotting of Complex function 5. Complex line integrals	

Text Books	
1.	B. S. Grewal, “Higher Engineering Mathematics”, Khanna Publishers, New Delhi.
2.	Erwin Kreyszig, “Advanced Engineering Mathematics”, John Wiley & Sons.
3.	B. V. Ramana, “Higher Engineering Mathematics”, Tata McGraw-Hill, New Delhi.
4.	William J. Palm III, Introduction to MATLAB for Engineers, McGraw-Hill.
Reference Books	
1.	H. K. Dass, “Advanced Engineering Mathematics”, S. Chand Publishing.
2.	Dr. B. S. Grewal, “Numerical Methods”, Khanna Publishers, Delhi.
3.	Merle C. Potter, “Advanced Engineering Mathematics”, OXFORD University Press, 3rd Edition.
4.	C. R. Wylie, “Advanced Engineering Mathematics”, McGraw Hill Publication, New Delhi.
5.	S. S. Sastry, “Engineering Mathematics (Volume-I)”, Prentice Hall Publication, New Delhi.
6.	M. D. Greenberg, “Advanced Engineering Mathematics”, Pearson Education.
Useful web links	
1.	**https://nptel.ac.in/courses/111105121**
2.	**https://nptel.ac.in/courses/111107119**
3.	**https://nptel.ac.in/courses/111105134**
4.	**https://nptel.ac.in/courses/111105167**

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">F.Y. Part I (All Programs) Semester II</td></tr>
<tr><td>Course Code</td><td colspan="5">IKS121</td></tr>
<tr><td>Course Category</td><td colspan="5">Indian Knowledge System</td></tr>
<tr><td>Course title</td><td colspan="5">Human Rights and Constitution</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>01</td><td>-</td><td>-</td><td>01</td><td>01</td></tr>
<tr><td rowspan="2">Evaluation Scheme</td><td>ISE</td><td>ESE</td><td>IE</td><td>IOE</td><td>Total</td></tr>
<tr><td>-</td><td>-</td><td>50</td><td>--</td><td>50</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Prerequisites for first-year engineering students taking this course include a basic understanding of constitutional law and an awareness of fundamental human rights principles. An interest in social justice issues and the ability to think critically and analytically are important. The course provides engineering students with a multidisciplinary perspective, allowing them to apply their technical knowledge to contribute to human rights promotion and protection in engineering contexts.</td></tr>
<tr><td>Course Rationale</td><td colspan="5">The course on Human Rights and Indian Constitution aims to provide students with a comprehensive understanding of the principles of human rights and their connection to the Indian Constitution. By examining the constitutional framework, students develop awareness and critical thinking skills, empowering them to actively engage in promoting and protecting human rights. Through the exploration of legal remedies and enforcement mechanisms, the course fosters ethical and inclusive citizenship, cultivating a culture of respect for human rights. Ultimately, students gain the knowledge, skills, and values necessary to navigate the complexities of human rights issues and contribute to their promotion and protection in various aspects of life.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Develop a comprehensive understanding of the fundamental principles of human rights and their relevance to the Indian Constitution.
2. Cultivate critical thinking and analytical skills for analyzing and addressing human rights issues within engineering contexts.
3. Foster awareness of the legal framework and mechanisms for protecting human rights, enabling students to become advocates for social justice.
4. Promote ethical and inclusive citizenship among engineering students, emphasizing the importance of upholding human rights in their professional and personal lives.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Understand the fundamental principles of human rights and their application in engineering contexts.
2. Apply critical thinking skills to analyze and address human rights issues within engineering projects.
3. Evaluate the legal framework and mechanisms for protecting human rights and propose strategies for advocacy in engineering practice.
4. Demonstrate ethical and inclusive citizenship by integrating human rights principles into professional conduct in engineering settings.</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1			1	2		3		2				
CO 2			2	2		2			2			3
CO 3		3	2				2		2			
CO 4						3		3				

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I.	**Introduction to Human Rights and Indian Constitution:** a) Overview of human rights principles and concepts b) Introduction to the Indian Constitution and its significance in protecting human rights	02
II.	**Fundamental Rights and Citizenship:** a) Understanding fundamental rights in the Indian Constitution b) Citizenship rights and their implications on human rights	02
III.	**Social Justice and Equality:** Equality before the law and anti-discrimination provisions Rights of marginalized communities and affirmative action policies	02
IV.	**Rights of Women and Children:** a) Gender equality and women's rights under the Indian Constitution b) Child rights, protection, and welfare laws in India	02
V.	**Freedom of Expression and Media Rights:** a) Freedom of speech and expression in the Indian context b) Media rights, press freedom, and challenges in the digital age	02
VI.	**Human Rights Institutions and Enforcement:** a) National and international human rights institutions b) Human rights enforcement mechanisms and legal remedies	02

Sr. No.	Reference Books
1.	Baxi, Upendra. The Future of Human Rights. Oxford University Press, 2008.
2.	Basu, Durga Das. Introduction to the Constitution of India. LexisNexis, 2019.
3.	Bhagwati, P. N., & Desai, S. M. Human Rights: International Challenges. Eastern Book Company, 2012.
4.	Mookherjee, Monika, & Shiva Rao, B. R. Perspectives on Human Rights. Oxford University Press, 2018.
5.	Murthy, S. N. Human Rights in India: Historical, Social, and Political Perspectives. Oxford University Press, 2006.
6.	Shah, A. G. The Constitution of India: Select Issues in Historical Perspective. Oxford University Press, 2014.

Sr. No.	Important web links
1.	**Human Rights Watch: https://www.hrw.org/**
2.	**National Human Rights Commission (NHRC): https://nhrc.nic.in/**
3.	**Ministry of Law and Justice, Government of India: https://www.molaw.gov.in/**
4.	**United Nations Human Rights: https://www.ohchr.org/**

Year, Program, Semester	F.Y, Part I (All Programs) Semester II						
Course Code	HSMEC121						
Course Category	Humanities and Social Sciences , Management, Environment Courses						
Course title	**Professional Communication (English)-II**						
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Total Credits**	
	02	-	-	02		00	
Evaluation Scheme	**ISE**	**ESE**	**IE**	**IPE**	**EOE**	**EPE**	**Total**
	-	-	50		-	-	50
Pre-requisites(if any)	Students must have the knowledge of basic English grammar, writing and reading skill						
Course Objectives	1. To acquire the techniques of letter, E-Mail writing 2. To learn drafting CV, cover letter, report and proposal writing 3. Learn interview techniques and group discussion skill 4. To develop reading and listening skill for better communication 5. To be acquaint workplace communication and etiquettes.						
Course Outcomes	1. Students will enable to write various types of business letters and official correspondences and to make students familiar with E-communication. 2. Students will learn the essentials of communication skill for the employment 3. The students will get ample practice of listening and reading skill 4. The students will acquaint with various soft skills and etiquettes at work place						

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12
CO1										3		2
CO2										3		2
CO3										3		2
CO4										3		2

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I.	Professional Correspondence – Principles, Features, Types, Format and layout of Business letter. Types of Business Correspondence – letters of Enquiry, Quotation, Order, Instructions, Sales, Credit, Complaint, Collection etc. E-mail writing	6
II.	Communication skill for Employment: Job Application letters -- Covering letter, Resume, C.V. Interview skill, Group Discussion skills - Features and Importance, presentation skills - Features, Types, Structure, Aids and Importance, Technical Proposal-Writing technical proposals. Technical Report -- Writing Technical Reports.	6
III.	Developing listening skill: difference between Hearing and Listening, listening process, Traits of good listener, Techniques to improve listening skills with audio/ video sample.	4
IV.	Reading skill: Importance of effective reading, types of reading, (Skimming; Scanning, Intensive reading, Extensive reading) Overcoming common obstacles, reading comprehension, tips and strategies to improve reading skill.	4
V.	Professional Communication at workplace: Soft skills. Kinesics, Para language, Interpersonal communication skills – Role of Personality and its various attributes like EQ, attitude, motivation, stress management and accepting criticism in determining efficacy of interpersonal communication, oral expressions in various professional contexts, Telephonic Etiquette. Corporate communication skills – Role of business etiquette, conducting meetings, managing conflict, negotiation, team spirit, decision-making, time management and problem solving skills.	6
	Text Books	
1	A Textbook of English Language Communication Skills, (ISBN-978-81-955465-2-7), Published by Infinite Learning Solutions, Bengaluru - 2022.	
2	Technical Communication – Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.	
3	David Irwin, “Effective Business Communications” Viva- Thorogood.	
4	Dhanavel. S P, “English and Soft Skills”, Orient BlackSwan. India 2018.	
	Reference Books	
1	Rajendra Pal and J S Korlaha, “Essentials of Business Communication” HI Sultan Chand and Sons, New Delhi	
2	Goldsmith, “Soft Skills: Enhancing Employability”, Marshall and M.S. Rao Dreamtech Press. India, 2020	
3	Technical Communication by Gajendra Singh Chauhan and Et al, (ISBN-978-93- 5350-050-4), Cengage learning India Pvt Limited [Latest Revised Edition] - 2019.	
4	Practical English Usage by Michael Swan, Oxford University Press – 2016.	
5	Functional English (As per AICTE 2018 Model Curriculum) (ISBN-978-93-5350-047-4) Cengage learning India Pvt Limited [Latest Edition 2019].	
	Useful web links	
1	**https://learnenglish.britishcouncil.org**	
2	**https://www.fluentu.com**	

Year, Program, Semester	F.Y. Part I (All Programs) Semester II				
Course Code	VSEC121				
Course Category	Vocational and Skill Enhancement Courses				
Course title	**Design Thinking and Innovation-II**				
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**	**Total Credits**
	01	01	-	02	00
Evaluation Scheme	IE at the course in charge end: (Preferred to have 3-5 assignments and conduct of an MCQ Test based on the course work. However, to declare whether the student has passed it or not. Passing is mandatory.				
Pre-requisites (if any)	Design Thinking & Innovation - I				
Course Rationale	The purpose of engineering education has to be to transform these graduates who can design. The concept of design or design thinking though complex, it is the robust and it must be developed among the budding graduates so as to make them not alone job seekers but the providers too. Therefore, the particular course is towards preparing engineering graduates as intended to be versatile of all other professionals.				
Course Objectives	1. Foster entrepreneurial mindset and innovative problem-solving. 2. Develop practical entrepreneurial skills for successful implementation. 3. Apply design thinking principles to solve real-world problems through hands-on activities. 4. Foster creativity, collaboration, and iterative problem-solving skills in a practical design thinking session.				
Course Outcomes	1. Identify and evaluate entrepreneurial opportunities, and develop innovative solutions. 2. Apply critical thinking, refine business models, and effectively communicate entrepreneurial ideas. 3. Demonstrate proficiency in utilizing design thinking tools and methods to generate innovative solutions. 4. Collaborate effectively in multidisciplinary teams to prototype and iterate on design concepts.				

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1		3	2						3			2
CO 2			2		2	3						
CO 3		2	2	2		2						
CO 4			3		2				3			

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Innovation and Entrepreneurship:** a) Introduction to innovation and entrepreneurship, market analysis, and creative confidence. b) Business model development, prototyping, and customer validation. **c)** Pitching and presentation skills, entrepreneurial skills, and mind-set development	12 (L)
	During the tutorial session itself for first 6 sessions, the course facilitator will complete these three sub units interactively while remaining 6 sessions will be free for the students to have the activities for which the following general guidelines to be followed: **General Instructions for course facilitators:** **The facilitators may use different student centric teaching learning methods to make the course content more and interesting and meaningful.** Some of the following activities may be planned j) Brain teasers (aka Puzzle Busters, to be solved individually) k) Cartoon captions (small teams) l) TRIZ, a systematic ideation method, reading (individual) m) Book readings and discussions (small teams) n) Small teams' presentations on innovation:(1) innovative individual, (2) innovative company, (3) innovative movie / game, (4) sustainable innovation, (5) innovation in business, (6) innovation in art, (7) innovation in architecture, (8) innovative nation, (9) innovation in science, and (10) innovation in engineering. o) Large groups hands-on projects p) Eight-dimensional (8D) ideation method examples q) Large teams' videos. r) Students also will be taken to the **workshop** to experience some kind of hands on training to make carpentry, metal or smithy job. (Care to be taken to make the students aware of Design Thinking & Customer Centricity Practical Examples of Customer Challenges, Use of Design Thinking to Enhance Customer Experience, Parameters of Product experience, Alignment of Customer Expectations with Product Design)	12 (T)

	Reference Books
1.	Gupta, V., Dutta, D., & Jain, V. (2019). The Inheritors: Stories of Entrepreneurship and Success. Penguin Random House India.
2.	Bagchi, S., & Bagchi, A. (2019). The Professional: Defining the New Standard of Excellence at Work. Hachette India.
3.	Das, S., & Nagpal, M. (Eds.). (2018). The Handbook of Indian Entrepreneurship. SAGE Publications India.
4.	Drucker, P. F. (2007). Innovation and Entrepreneurship: Practice and Principles. Harper Business.
5.	Blank, S. G. (2012). The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company. K&S Ranch.
6.	Christensen, C. M. (2013). The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail. Harvard Business Review Press.
	Important web links
1.	**YourStory (https://yourstory.com/)**
2.	**Inc42 (https://inc42.com/):**

Year, Program, Semester	F.Y. Part I (All Programs) Semester II				
Course Code	PSI 121				
Course Category	Project Seminar Internship				
Course title	**Social Internship**				
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits
	10 Days Social Internship				00
Evaluation Scheme	IE: 50				Total =50
Pre-requisites(if any)	Design Thinking and Innovation-I and orientation by the Program before proceeding on to this internship.				
Course Objectives	1. Cultivate rural awareness and empathy among students. 2. Enable students to apply engineering skills effectively in underserved areas.				
Course Outcomes	1. Increased recognition of rural challenges and dynamics. 2. Demonstrated ability to devise and implement relevant solutions.				

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1		3		2		3	3		3			2
CO 2			2	2		3						3

Level of Mapping as: Low 1, Moderate 2, High 3

Social Internship Course Description

After the First Semester of FY B. Tech, the students will undergo social internship of 10 days preferably in rural part of the country.

Here are some of the potential activities that students could engage in during their 10-day social internship:

1. **Community Needs Assessment:**
   - Conduct surveys and interviews to understand the specific needs and challenges of the community.
   - Identify priority areas for potential engineering interventions.
2. **Interactive Workshops:**
   - Organize workshops to share basic engineering concepts with community members, fostering mutual learning.
   - Collaborate on simple projects, like building low-cost solar cookers or water purification systems.
3. **Design Thinking Sessions:**
   - Facilitate brainstorming sessions with locals to generate innovative ideas for solving local problems.
   - Prototype and refine potential solutions based on community input.
4. **Infrastructure Evaluation:**

- Assess existing infrastructure (water supply, sanitation, roads, etc.) for maintenance needs or improvements.
- Propose feasible upgrades using engineering principles.

5. **Environmental Initiatives:**
   - Participate in tree planting drives or waste management campaigns to promote environmental sustainability.
   - Educate the community about eco-friendly practices.
6. **Skill Enhancement Workshops:**
   - Teach basic technical skills, such as basic repairs, to empower locals to address minor challenges independently.
   - Provide training on digital literacy to bridge the technological gap.
7. **Health and Hygiene Workshops:**
   - Conduct workshops on personal hygiene, sanitation, and health awareness.
   - Collaborate with healthcare professionals to provide basic medical check-ups and guidance.
8. **Documentation and Reporting:**
   - Maintain a daily journal to document experiences, observations, and interactions.
   - Compile a comprehensive report outlining findings, proposed solutions, and lessons learned.
9. **Cultural Exchange Activities:**
   - Engage with the community through cultural activities, such as sharing traditional dances, songs, or cuisine.
   - Foster a sense of unity and understanding between students and locals.
10. **Feedback and Reflection Sessions:**
    - Regularly engage in discussions to reflect on the challenges faced, lessons learned, and potential improvements.
    - Gather feedback from both students and community members to enhance the internship's impact.

The specific activities may vary based on the community's needs and the students' skills. The key is to create meaningful interactions that promote learning, collaboration, and positive impact.

Equivalence for the curriculum revision at First Year B. Tech

We at the B. Tech (All Programs), Department of Technology due for revision in curriculum w.e.f. 2023-2024 have revised the structure and the content as well at the F.Y.B. Tech .The entire structure for Second Year to Final Year B. Tech respective Programs is also designed under this revision. The detailed of course content will be designed and submitted as the First Year batch proceed year to year.

A special mention rather feature of this revision is, ***it is in line with New National Education Policy 2020 guidelines.*** It is our every effort to incorporate most of the key features of NEP2020. Also it has taken due care to match with the National Credit Framework requirements as well as an attempt is made to make it in alignment with AICTE Model curricula.

Following is a semester wise table that depicts equivalences for the previous version of curriculum with the new one particularly for first two semesters under F.Y B.Tech.

SEM – I

Sr. No.	First Year B. TechSemester I **Pre-revised syllabus**	**First Year B. TechSemester I Revised syllabus**	**Remark**
1.	Engineering Mathematics–I	Engineering Mathematics–I	Content is revised
2.	Engineering Physics (Theory & Lab)	Engineering Physics (Theory & Lab)	Content is revised
3.	Basics of Mechanical Engineering (Theory & Lab)	-	-
4.		Elements of Mechanical and Electronics Engineering (Theory & Lab)	Two courses of the previous version are clubbed.
5.	Engineering Mechanics (Theory & Lab)	Engineering Mechanics (Theory & Lab)	Content is revised
6.	Basic Electronics Engineering (Theory & Lab)	-	Clubbed with other course.
7.	Computer Programming (Lab)	Computer Programming for Engineers (Theory & Lab)	Content is revised
8.	Workshop Practice (Lab)	-	A new course called design thinking & Innovation is introduced in lieu.
9.	-------	Professional Communication (English)-I (Theory)	Content is revised, split in I & II, It is as an audit course.
10.	-------	Design Thinking and Innovation-I	Newly introduced audit course.
11.	-------	Yoga and Meditation	Newly introduced Credit course.

SEM – II

Sr. No.	First Year B. Tech Semester II Pre-revised syllabus	First Year B. TechSemester II Revised syllabus	Remark
1.	Engineering Mathematics–II	Engineering Mathematics–II	Content is revised.
2.	Engineering Chemistry (Theory & Lab)	Engineering Chemistry (Theory & Lab)	Content is revised.
3.	Engineering Graphics (Theory & Lab)	Engineering Graphics (Theory & Lab)	Content is revised.
4.	Basic Civil Engineering (Theory & Lab)	-	-
5.	-	Elements of Civil and Electrical Engineering (Theory & Lab)	Two courses are clubbed with content revision
6.	Basic Electrical Engineering (Theory & Lab)	-	-
7.	-	Electrical-Electronic Components and Devices (Theory & Lab)	Two courses are clubbed with content revision
8.	Programming with Scilab and Matlab (Lab)	-	-
9.	ProfessionalCommunication (Lab)	Professional Communication (English)-II (Theory)	Content is revised, split in I & II, It is as an audit course.
10.	-	Design Thinking and Innovation-II	Newly introduced audit course.
11.	-	Social Internship	Newly introduced audit course
12.	-	Human Rights and Constitution	Newly introduced Credit course.

Courses against Certificate in Respective B.Tech Major

(Exit After First Year B.Tech)

Here onwards are the Program Wise course contents for the two courses, two credits each per Program. These need to be completed by the candidates who wish to exit after their First Year of B.Tech with a claim to be the awardees for the Certificate in respective Major Specialization. The candidates also have to undergo one month industrial internship with 4 credits, thus with total earning of **08 credits** against this certification. Also such candidates have to pay separate fees for such a certification.

Shivaji University, Kolhapur

Department of Technology

B. Tech (Chemical Engineering), Exit After First Year (Certificate Course in Chemical Engineering)

Teaching & Evaluation Scheme

S.N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	SWAYAM (NPTEL) or any other MOOCs Or Face to face mode Or Self-Study Mode (Program Core Courses)	CC- CHE1	Fundamentals of Chemical Engineering	02	-	-	02	02	30:70	00:00
2.		CC- CHE2	Introduction to Distributed Control System	02	-	-	02	02	30:70	00:00
3.	Program Based Internship	CC-PBI	In plant Training	One Month				04	00:00	50:50
				-	-	-	-	**08***	**200****	**100**
			Total Hours	**04**	-	-	**04**	-	-	-

Note: The Workload against the Certificate Course will be finalised at the Program Level considering the strength of the students seeking for the Certificate. *Obtaining these credits will be in addition to 42 regular credits at FY B. Tech

** There is an option for End Semester Examination either on respective MOOC platform if any or through the University System.

Note 1: The students aspiring to exit after first year will undergo the study of courses/MOOC from the list provided by the Program.

Note 2: Program Specific Industry Internship to be completed by such students before commencement of SY B. Tech.

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">First Year B. Tech (Chemical Engineering), Part I, Semester I & II</td></tr>
<tr><td>Course Code</td><td colspan="5">CC-CHE 1</td></tr>
<tr><td>Course Category</td><td colspan="5">Certificate in Chemical Engineering</td></tr>
<tr><td>Course title</td><td colspan="5">Fundamentals of Chemical Engineering</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>02</td><td>-</td><td>-</td><td>02</td><td>02</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">ISE:30</td><td colspan="2">ESE: 70</td><td>Total=100</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Prerequisites for this course typically include a solid background in chemistry and mathematics, including topics like stoichiometry, chemical equations, and calculus. Basic understanding of physics principles, such as thermodynamics and fluid mechanics, is also helpful. Familiarity with engineering fundamentals and problem-solving skills is advantageous.</td></tr>
<tr><td>Course Rationale</td><td colspan="5">The course provides a comprehensive introduction to the core principles and concepts in chemical engineering. It aims to equip students with the foundational knowledge and skills necessary to understand and analyze chemical processes, perform mass and energy balances, and apply engineering principles to solve problems in the field of chemical engineering.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Apply chemical engineering principles to analyze and solve engineering problems in various process industries.
2. Evaluate and interpret mass and energy balances in chemical systems using quantitative analysis techniques.
3. Demonstrate an understanding of thermodynamics and its application to chemical processes.
4. Assess and analyze the performance and design of chemical reactors and separation processes.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Apply chemical engineering principles to solve complex engineering problems in diverse process industries.
2. Analyze and interpret mass and energy balances in chemical systems to ensure efficient and sustainable operations.
3. Explain the application of thermodynamics in predicting and optimizing the behaviour of chemical processes.
4. Evaluate and propose effective reactor designs and separation processes based on performance analysis and optimization techniques.</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3		2								
CO 2		3	2	2								
CO 3	3		2									
CO 4			2		2							

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I.	**Introduction to Chemical Engineering:** • Overview of chemical engineering principles, scope, and applications • Fundamentals of chemical processes, unit operations, and process flow diagrams • Introduction to mass and energy balances in chemical systems • Overview of safety considerations and ethical responsibilities in chemical engineering	**04**
II.	**Thermodynamics and Phase Equilibrium:** • Introduction to thermodynamics and its application in chemical engineering • Laws of thermodynamics and their relevance to chemical processes • Phase equilibrium and its significance in chemical systems • Application of thermodynamics to analyze and predict phase behaviour in chemical processes	**04**
III.	**Chemical Reaction Engineering**: • Fundamentals of chemical kinetics and reaction rate equations • Analysis of reaction mechanisms and rate-determining steps • Reactor types and their design considerations • Application of reaction engineering principles to optimize chemical reactions	**04**
IV.	**Heat and Mass Transfer:** • Principles of heat transfer and its application in chemical engineering • Conduction, convection, and radiation heat transfer mechanisms • Mass transfer fundamentals and its relevance in chemical processes • Design and analysis of heat exchangers and mass transfer equipment	**04**
V.	**Separation Processes:** • Introduction to separation processes in chemical engineering • Distillation, absorption, extraction, and adsorption processes • Membrane separation techniques and their applications • Analysis and optimization of separation processes in chemical systems	**04**
VI.	**Process Control and Safety:** • Basics of process control and instrumentation in chemical engineering • Control system components, feedback loops, and PID control • Safety considerations and hazard analysis in chemical processes • Overview of regulatory frameworks and best practices for process safety	**04**

Reference Books	
1.	Felder, R. M., & Rousseau, R. W. (2016). Elementary Principles of Chemical Processes. Hoboken, NJ: Wiley.
2.	Smith, J. M., Van Ness, H. C., & Abbott, M. M. (2017). Introduction to Chemical Engineering Thermodynamics. New York, NY: McGraw-Hill Education.
3.	Levenspiel, O. (2016). Chemical Reaction Engineering. Hoboken, NJ: Wiley.
4.	Coulson, J. M., Richardson, J. F., Sinnott, R. K., & Towler, G. (2017). Chemical Engineering Design: Principles, Practice, and Economics of Plant and Process Design. Oxford, UK: Butterworth-Heinemann.
5.	Seader, J. D., Seader, J. F., & Lewin, D. R. (2016). Separation Process Principles. Hoboken, NJ: Wiley.
Important web links	
1.	AIChE (American Institute of Chemical Engineers): https://www.aiche.org/
2.	Chemical Engineering World: https://www.chemengonline.com/

Year, Program, Semester	First Year B. Tech (Chemical Engineering), Part I, Semester I & II				
Course Code	CC-CHE 2				
Course Category	Certificate in Chemical Engineering				
Course title	Introduction to Distributed Control System				
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**	**Total Credits**
	02	-	-	02	02
Evaluation Scheme	**ISE:30**		**ESE: 70**		**Total=100**
Pre-requisites (if any)	Prerequisites: Basic understanding of control systems and familiarity with principles of science and engineering.				
Course Rationale	The course offers participants a foundational understanding of DCS technology and its significance in modern industries. By covering key aspects such as architecture, programming, integration, and maintenance, the course prepares participants to contribute effectively to DCS-driven operations. This knowledge serves as a stepping stone for further studies and career opportunities in chemical engineering, automation, and related fields. Ultimately, the course empowers participants to grasp the principles and advantages of DCS and apply them practically in real-world scenarios.				
Course Objectives	1. Understand DCS principles, components, and advantages over traditional control systems. 2. Gain practical skills in configuring and programming DCS systems for industrial control strategies. 3. Develop troubleshooting and maintenance abilities to ensure reliable DCS operation. 4. Explore DCS integration, human-machine interfaces (HMIs), and emerging trends in the field.				
Course Outcomes	1. Understand DCS principles, components, and advantages over traditional control systems. 2. Apply DCS configuration and programming skills to design and implement control strategies in industrial applications. 3. Demonstrate proficiency in troubleshooting and maintenance to ensure reliable DCS operation. **4.** Analyze DCS integration, human-machine interfaces (HMIs), and emerging trends to assess their impact on industrial control systems.				

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1			3	2	2							
CO 2		3	2	2								
CO 3		2	3	2	2							
CO 4			2		2	2						

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I..	**Introduction to Control Systems** • Overview of control systems and their importance in various industries • Introduction to basic control principles: feedback, feedforward, and closed-loop control. • Types of control systems: centralized vs. distributed control • Introduction to DCS components: sensors, actuators, controllers	04
II.	**DCS Architecture and Configuration** • Understanding the architecture and structure of a DCS • Introduction to hardware components of a DCS: controllers, input/output (I/O) modules • Introduction to DCS software and configuration tools • Basics of communication protocols used in DCS	04
III..	**DCS Programming and Control Strategies** • Introduction to programming languages used in DCS • Basics of control strategies and their implementation in DCS • Overview of process control loops and tuning parameters • Simple control algorithm design using DCS programming language	04
IV.	**DCS Integration in Industries** • Integration of DCS with various industries: manufacturing, power, chemical, etc. • Introduction to safety instrumented systems (SIS) and programmable logic controllers (PLC) • Overview of field instrumentation in DCS: sensors, transmitters, control valves • Examples of DCS integration in different industrial processes	04
V.	**Human-Machine Interface (HMI) and Operator Interaction** • Understanding the role of HMI in DCS • Basics of HMI design and layout principles • Introduction to real-time monitoring and control through HMIs • Overview of alarms and operator response in DCS environments	04
VI.	**DCS Maintenance and Troubleshooting** • Introduction to preventive maintenance practices for DCS • Troubleshooting techniques for common DCS issues • Importance of software updates, backups, and system security in DCS • Basic safety considerations during maintenance activities	04

Reference Books	
1.	Wilkes, M.J. (1998). Distributed Control Systems: Their Evaluation and Design. Addison-Wesley.
2.	Gopal, M. (2005). Distributed Control Systems: Concepts and Applications. Alpha Science International Ltd.
3.	Bailey, D.H. (2001). Distributed Control Systems: Their Implications for Process Industries. Wiley-Interscience.
4.	IDC Technologies. (2003). Practical Distributed Control Systems (DCS) for Engineers and Technicians. IDC Technologies.
Important web links	
1.	URL: https://www.controlglobal.com/
2.	URL: https://www.isa.org/

Shivaji University, Kolhapur
Department of Technology

B.Tech (Civil Engineering), Exit After First Year (Certificate Course in Civil Engineering)
Teaching and Evaluation Scheme

S.N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
				L	T	P			ISE:ESE	IE:EE
1	SWAYAM (NPTEL) or any other MOOCs Or In face to face mode (Program Core Courses)	CC-CE 1	Fundamentals of Civil Engineering	02	-	-	02	02	30:70	00:00
2		CC- CE 2	Building Planning and Design	02	-	-	02	02	30:70	00:00
3	Program Based Internship	CC-PBI	Industrial Internship	One Month				04	00:00	50:50
							-	**08***	**200****	**100**
			Total Hours	**04**	**-**	**-**	**04**	**-**		

***Note: The Workload against the Certificate Course will be finalised at the Program Level considering the strength of the students seeking for the Certificate.* *Obtaining these credits will be in addition to 42 regular credits at FY B. Tech**

**** There is an option for End Semester Examination either on respective MOOC platform if any or through the University System.

Note 1: The students aspiring to exit after first year will undergo the study of course/MOOC from the list provided by the Program.

Note 2: Program Specific Industry Internship to be completed by such students before commencement of SY B. Tech.

Year, Program, Semester	First Year B. Tech (Civil Engineering), Part I, Semester I & II				
Course Code	CC-CE 1				
Course Category	Certificate in Civil Engineering				
Course title	Fundamentals of Civil Engineering				
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**	**Total Credits**
	02	-	-	02	02
Evaluation Scheme	**ISE:30**		**ESE: 70**		**Total=100**
Pre-requisites (if any)	---				
Course Rationale	Every civil engineering activity takes place on the surface of earth and starts with availing and measuring the land, with the subject engineering students will pursue the engineering approach about surveying and Civil engineering is that field of engineering concerned with planning, design and construction for environmental control, development of natural resources, buildings, transportation facilities and other structures. The subject involves surveying activities of taking various measurements on ground that promote habit of working in groups, neatness and care in documentation and also involves introduction of engineering materials and elements of building materials.				
Course Objectives	1. To provide an insight and inculcate the essentials of Civil Engineering discipline to the students 2. To provide the students an illustration of the significance of the Civil Engineering Profession in satisfying the societal needs.				
Course Outcomes	1. Understand the use of different materials in Civil Engineering 2. Apply the various building components, method of constructions and services 3. Apply different equipment for levelling and surveying				

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	3	2	2									2	
CO 2	2	3	2	2									2	
CO 3	3	2	3	2									2	

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Introduction To Civil Engineering and Civil Engineering Materials:** Various branches and scope of civil engineering, Role of Civil Engineer, building materials- cement, sand, aggregate, timber, steel, aluminium. Selection of good material. Engineering properties and testing of materials. Concrete- Ingredients, grades, various processes like mixing, transportation, placing, compaction and curing. Readymade concrete plants (RMC).	8
II	**Introduction to Surveying and Levelling:** Surveying: Importance, objectives and principles. Linear Measurement-Instruments used-Pedometer, electronic distance meter, etc. Angular Measurement-Instrument Used-Electronic theodolite and total station. Levelling: Definitions, terminologies, principles, instruments used, problems based on HI method and Rise and fall method.	8
III	**Scope of civil engineering** a) Transportation engineering- roads, railways, waterways and air ways. Basic of types and important features in design b) Environmental engineering- Water and sanitary system, water, soil and air pollution. Industrial waste disposal. c) Water resource engineering- Irrigation methods, types of dams, major dams in India, dam capacity. Dam maintenance.	8
Text/Reference Books		
1.	N. N. Basak, “Surveying and levelling”, Tata McGraw Hill Education.	
2.	S.C. Rangwala, “Civil engineering drawing”, Charotar Publication	
3.	S. C. Rangwala, “Town Planning”, Charotar Publication	
4.	S. Ramamrutham, “Basic Civil Engineering”, Dhanpatrai Publication	
5.	H.S. Peavy, D.R. Rowe and G. Tchbanoglous, “Environmental Engineering”, McGraw Hill International Edition	
Important web links		
1.	https://onlinecourses.nptel.ac.in/noc22_ce42/preview	

Year, Program, Semester	First Year B. Tech (Civil Engineering), Part I, Semester I & II				
Course Code	CC-CE2				
Course Category	Certificate in Civil Engineering				
Course title	Building Planning and Design				
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**	**Total Credits**
	02	-	-	02	02
Evaluation Scheme	**ISE:30**		**ESE: 70**		**Total=100**
Pre-requisites (if any)	---				
Course Rationale	This subject is core technology subject, enabling the principles of planning for drafting the content into graphical form and there after its execution. Civil engineer has to convert design parameter and process details into actual practice. The principles of planning for building includes the entire facility to be provided as per the individual requirements, economical status and suitable to the users. Therefore students are required to understand, interpret and prepare working drawing.				
Course Objectives	1. To illustrate the importance and application of regulations such as building byelaws and provisions of codes. 2. To optimize space use and user functionality in designs. 3. To prepare engineering drawings as per principles of planning using CAD Software.				
Course Outcomes	1. Understand the symbols, signs and conventions from the given drawing. 2. Determine line plans of residential and public buildings using principles of planning. 3. Apply submission and working drawing from the given requirement for Load Bearing Structure. 4. Apply submission and working drawing from the given requirement for Framed Structure.				

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	3	2										2	
CO 2	2	3	2										2	
CO 3	3	2	3										2	
CO 4	2	3	2										2	

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I.	**Building planning, designing** Building Planning Bye laws and regulations, National Building code of India (introduction only), Planning of residential building [bungalows, row Bungalows, apartments and twin bungalows (conceptual only)], UDCPR, Introduction to administration, - Development permission and commencement certificate, General building requirements, Structural safety, Role of architect, structural engineer and geotechnical engineer in building design. Concept of green building, Planning using AutoCAD.	8
II	**Building Construction-**Foundations- types, soil bearing capacity Load bearing and framed structures, partition walls, types of masonry, AAC block construction. Water proofing treatments, celling design, acoustic treatments. damp roof course, building maintenance.	8
III	**Water supply and sanitary-** Design of water storage system, plumbing materials, various types of taps, design of septic tank, plumbing and sanitary pipes, use of traps, chambers and vent pipes. Repair and maintenance of plumbing and sanitary lines, solar panels	8
	Text Books	
1.	Shah, Kale, Patki, " Building Drawing", Tata McGraw- Hill publication	
2.	S.P. Arora, S.P. Bindra, "A Text Book of Building Construction", Dhanpat Rai Publications.	
	Reference Books	
1.	Gangrad M.N, Deshmukh B.S., Kanitkar A.K., "A Text book of Building Drawing", Nirali Prakashan	
2.	Charusheela, M. S., Jamadar, "Civil Engineering Drawing", Nirali Prakashan	
3.	SP 7- National Building Code Group 1 to 5 - B.I.S. New Delhi	
4.	UDCPR, Urban Development Department, Government of Maharashtra.	
5.	V.B. Sikka, "A Course in Civil Engineering Drawing", S.K .Kataria and Sons.	
	Useful web links	
1.	https://www.youtube.com/watch?v=ph0SYPBq4lY&list=PLkEhI-YDhJ6zuSPVaWcLmaT0R2g4L53G-	
2.	https://www.youtube.com/watch?v=FF_5w5hZav4	
3.	https://nptel.ac.in/courses/124107157	
4.	https://archive.nptel.ac.in/courses/112/102/112102304/	

Shivaji University, Kolhapur

Department of Technology

B. Tech (Computer Science and Technology), Exit After First Year (Certificate Course in Computer Science and Technology)

Teaching & Evaluation Scheme

S.N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	SWAYAM (NPTEL) or any other MOOCs Or any other course from in face to face mode (Program Core Courses)	CC-CST 1	Fundamentals of Computer Science and Technology	02	-	-	02	02	30:70	00:00
2.		CC- CST 2	Concept of Programming Using C	02	-	-	02	02	30:70	00:00
3.	Program Based Internship	CC-PBI	Industrial Internship	One Month				04	00:00	50:50
				-	-	-	-	**08***	**200**	**100**
			Total Hours	**04**	-	-	**04**	-	-	-

Note: The Workload against the Certificate Course will be finalised at the Program Level considering the strength of the students seeking for the Certificate. ***Obtaining these credits will be in addition to 42 regular credits at FY B. Tech**

**** There is an option for End Semester Examination either on respective MOOC platform if any or through the University System.

Note 1: The students aspiring to exit after first year will finalise the title of the course/MOOC from the list provided by the Program.

Note 2: Program Specific Industry Internship to be completed by such students before commencement of SY B. Tech.

Year, Program, Semester	First Year B. Tech (Computer Science and Technology), Part I, Semester I & II				
Course Code	CC-CST 1				
Course Category	Certificate in Computer Science and Technology				
Course title	Fundamentals of Computer Science and Technology				
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**	**Total Credits**
	02	-	-	02	02
Evaluation Scheme	**ISE:30**		**ESE: 70**		**Total=100**
Pre-requisites (if any)	Preliminary knowledge of computer, their operations and applications.				
Course Rationale	This course provides an overview of introductory concepts about computers, number systems, basics of software, operating system and components of computer system. It builds the foundation of the computer application courses.				
Course Objectives	1. To Introduce Computer Science and Technology in a simple language to students. 2. To help students to pursue specialized programs leading to technical and professional careers and certifications in the IT industry. 3. To introduce skills relating to IT basics, computer applications, programming, interactive medias, Internet basics etc. 4. To introduce basics of operating system and data communications.				
Course Outcomes	1. Understand basic concepts and terminology of Computer Science and Technology. 2. Have a basic understanding of personal computers and their operations. 3. Understand computer arithmetic. 4. Familiar with various software and operating system. 5. Demonstrate concept of data communication.				

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2			3							
CO 2	2				2							
CO 3	3											
CO 4			2		3							
CO5					2							

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I.	**Introduction to Computers and Computer Organization :** Introduction, Definition, .Characteristics of computer, Evolution of Computer, Block Diagram Of a computer, Generations of Computer, Classification Of Computers, Applications of Computer, Capabilities and limitations of computer. Role of I/O devices in a computer system. Input Units and types, Output Units and types	**04**
II.	**Computer Arithmetic:** Binary, Binary Arithmetic, Number System: Positional & Non Positional, Binary, Octal, Decimal, Hexadecimal, Converting from one number system to another , Converting from one number system to another , Converting from one number system to another.	**04**
III.	**Storage Fundamentals:** Primary Vs. Secondary Storage, Data storage & retrieval methods. Primary Storage: RAM	**04**

	ROM, PROM, EPROM, EEPROM. Secondary Storage: Magnetic Tapes, Magnetic Disks. Cartridge tape, hard disks, Floppy disks Optical Disks, Compact Disks, Zip Drive, Flash Drives.	
IV.	**Software:** Software and its needs, Types of S/W. **System Software**: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. **Application S/W** and its types: Word Processing, Spread Sheets Presentation, Graphics, DBMS s/w.	**04**
V.	**Operating System:** Functions, Measuring System Performance, Assemblers, Compilers and Interpreters. Batch Processing, Multiprogramming, Multi-Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux.	**04**
VI.	**Data Communication:** Communication Process, Data Transmission speed, Communication Types (modes), Data Transmission Medias, Modem and its working, characteristics, Types of Networks, LAN Topologies, Computer Protocols, Concepts relating to networking.	**04**

Text Books	
1.	Computer Fundamentals by P.K.Sinha , BPB Publication, New Delhi, India
Reference Books	
1.	Fundamentals of Computers by E.Balguruswamy, McGraw-Hill Education, Europe
2.	Introduction to Computer Fundamentals by Bright Saiw Afriyie, Trafford Publishing

Year, Program, Semester	First Year B. Tech (Computer Science and Technology), Part I, Semester I & II				
Course Code	CC-CST 2				
Course Category	Certificate in Computer Science and Technology				
Course title	Concept of Programming Using C				
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**	**Total Credits**
	02	-	-	02	02
Evaluation Scheme	**ISE:30**		**ESE: 70**		**Total=100**
Pre-requisites (if any)	Basic knowledge of C Programming				
Course Rationale	C programming using data Structures are necessary for designing efficient algorithms. It provides reusability and abstraction. Using appropriate data structures can help programmers save a good amount of time while performing operations such as storage, retrieval, or processing of data. Manipulation of large amounts of data is easier.				
Course Objectives	1. To teach efficient storage mechanisms of data for an easy access. 2. To design and implementation of various basic and advanced data structures. 3. To introduce various techniques for representation of the data in the real world. 4. To develop application using data structures. 5. To improve the logical ability				
Course Outcomes	1. To choose appropriate data structure as applied to specified problem definition. 2. To handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures. 3. To apply concepts learned in various domains like DBMS, compiler construction etc. 4. To use linear and non-linear data structures like stacks, queues, linked list. 5. To write the programs using data structures in C.				

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1		2										
CO 2		3										
CO 3					2							
CO 4		2	3									
CO5		2	2									

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I.	Introduction to the C Language – Algorithm, Pseudo code, Flow chart, Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output, Operators(Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence and Associatively, Expression Evaluation, Type conversions.	**04**
II.	Enumerated, Structure ,and Union Types– The Type Definition (typedef), Enumerated types, Structures –Declaration, initialization, accessing structures, operations on structures, Complex structures, structures and functions, Passing structures through pointers, self-referential structures, unions, bit fields, C programming examples.	**04**
III.	Data Structures – Introduction to Data Structures, abstract data types.	**04**

	Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, circularly linked lists- Operations for Circularly linked lists, doubly linked list implementation, insertion, deletion and searching operations, applications of linked lists.	
IV.	Stack ADT- definition, operations, array and linked implementations in C, applications-infix to postfix conversion, Postfix expression evaluation, recursion implementation. Queue ADT- definition and operations, array and linked Implementations in C, Circular queues-Insertion and deletion operations, Deque (Double ended queue) ADT, array and linked implementations in C	**04**
V.	Searching and Sorting – Searching-linear and binary search methods Sorting- selection sort, bubble sort, insertion sort, quick sort, merge sort comparison of sorting and searching methods.	**04**
VI.	Trees – Definitions, tree representation, properties of trees, Binary tree, Binary tree representation, binary tree properties, binary tree traversals, binary tree implementation, applications of trees.	**04**

Text Books	
1.	Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2.	The C Programming Language by Brian Kernighan and Dennis Ritchie 2nd edition
Reference Books	
1.	Let Us C by Yashavant Kanetkar, BPB Publications.
2.	Absolute beginner's guide to C, Greg M. Perry, Edition 2, Publisher: Sams Pub., 1994.
3.	Computer Programming and Data Structures by E Balagurusamy, Tata McGraw Hill.

Shivaji University, Kolhapur

Department of Technology

B.Tech (Electronics & Telecommunication Engineering), Exit After First Year (Certificate Course in Electronics & Telecommunication Engineering)

Teaching & Evaluation Scheme

S.N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	SWAYAM (NPTEL) or any other MOOCs	CC-ETC 1	Consumer Electronics	02	-	-	02	02	30:70	00:00
2.	Or any other course from in face to face mode (Program Core Courses)	CC-ETC 2	Digital Techniques	02	-	-	02	02	30:70	00:00
3.	Program Based Internship	CC-PBI	Industrial Internship	One Month				04	-	50:50
							-	**08***	**200****	**100**
			Total Hours	**04**	**-**	**-**	**04**	**-**	**-**	**-**

Note: The Workload against the Certificate Course will be finalised at the Program Level considering the strength of the students seeking for the Certificate. ***Obtaining these credits will be in addition to 42 regular credits at FY B. Tech**

**** There is an option for End Semester Examination either on respective MOOC platform if any or through the University System.

Note 1: The students aspiring to exit after first year will finalise the title of the course/MOOC from the list provided by the Program.

Note 2: Program Specific Industry Internship to be completed by such students before commencement of SY B. Tech.

Year, Program, Semester	First Year B. Tech (Electronics & Telecommunication Engineering), Part I, Semester I & II				
Course Code	CC-ETC 1				
Course Category	Certificate in Electronics & Telecommunication Engineering				
Course title	**Consumer Electronics**				
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**	**Total Credits**
	02	-	-	02	02
Evaluation Scheme	**ISE:30**		**ESE: 70**		**Total=100**
Pre-requisites (if any)	Preliminary knowledge of Semiconductor Physics, Basic science and mathematics				
Course Rationale	This course will introduce the students with working principles of consumer electronic appliances like audio video systems, microwave oven, washing machine and others and to troubleshoot the same in systematic way. Such knowledge help them to start their own enterprises				
Course Objectives	1. Introduce fundamental concept of audio 2. Explain the principles and operations of audio systems 3. Explain TV fundamentals and transmitter receiver operation 4. Develop a skill to troubleshoot consumer electronic appliances.				
Course Outcomes	1.Troubleshoot different types of microphones and speakers 2.Maintain audio systems 3.Analyse the composite video signal in TV receivers and Troubleshoot colour TV receivers 4. Maintain various consumer electronics appliances				

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	3		3							
CO 2	2	3			2							
CO 3	3											
CO 4		3	2		3							

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I.	**Audio Fundamentals** Basic characteristics of sound signal, mono and stereo amplifiers, microphone working principle and types, speakers working principle and types, troubleshooting procedure	**04**
II..	**Audio Systems** Block diagram and operation of CD player, components of CD mechanism, Hi-Fi amplifier, PA system block diagram and operation, speaker impedance matching system , Home theatre system, troubleshooting of audio systems	**04**

III.	**Television Fundamentals** Basic concepts as aspect ratio, image continuity, interlace scanning, scanning periods, resolution, VSB transmission, colour signal bandwidth, colour theory, CCIR-B standards, positive and negative modulation, merits and demerits of negative modulation.	**04**
IV.	**Television Transmitters** TV transmission and reception, monochrome transmitter- block diagram and operation and colour TV transmitter block diagram and operation and troubleshooting.	**04**
V.	**Television Receivers** Block diagram of colour TV receiver and operation, PAL-D decoder operation, principle and working of LCD TV, LED TV, troubleshooting of colour TV receiver	**04**
VI.	**Consumer Electronic Appliances** Principle of operation of microwave oven, washing machine, digital camera, and their troubleshooting procedure	**04**

Text Books	
1.	Bali, S.P. Consumer Electronics, Pearson Education India, Delhi 2007
2.	Gupta R.G. Audio Video systems principles, maintenance and troubleshooting. Mc Graw Hill, New Delhi, India.2010
Reference Books	
1.	Gulati R.R. Modern Television Practice: Transmission, Reception and Applications. New Edge International, New Delhi 2015
2.	Bali Rajeev, Bali S.P. Audio Video systems: Principle, Practices and troubleshooting. Khanna Book Publishing Co.(P) Ltd.Delhi.2014

Year, Program, Semester	First Year B. Tech (Electronics & Telecommunication Engineering), Part I, Semester I & II				
Course Code	CC-ETC 2				
Course Category	Certificate in Electronics & Telecommunication Engineering				
Course title	**Digital Techniques**				
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**	**Total Credits**
	02	-	-	02	02
Evaluation Scheme	**ISE:30**		**ESE: 70**		**Total=100**
Pre-requisites (if any)	Preliminary knowledge of Basic science and mathematics				
Course Rationale	This course deals with analysis and design of various digital electronic circuits with its applications.				
Course Objectives	1. Introduce fundamental concept of digital techniques. 2. Enhance basic knowledge of digital logic. 3. Develop a skill to design and implement digital circuits. 4. Conduct the analysis of various digital electronic circuits.				
Course Outcomes	1. Understand number systems and its arithmetic operations and Illustrate use of Boolean algebra. 2. Formulate and apply Karnaugh Map to reduce Boolean expressions and logic circuits to their simplest forms. 3. Design of combinational circuits like comparators multiplexers, de-multiplexers, encoder, decoder and different code converters. 4. Understand working of flip-flops, its characteristics and conversion using truthtable.				

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	3		3							
CO 2	2	3	2		2							
CO 3	3	3										
CO 4			2		3							

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I.	**Binary Codes and Boolean algebra** Binary Number System. Addition, Subtraction, Multiplication, Division of binary numbers. Binary codes: weighted and non-weighted codes, self-complementary codes, BCD, Gray codes, Alphanumeric codes, ASCII Codes. Boolean algebra: Boolean Laws and Expression using Logic Gates, Universal gates, De-Morgan's Theorem, Duality Theorems.	**04**
II.	**Boolean Function minimization Techniques** Standard forms: SOP, POS, Simplification of Switching function & representation	**04**

	(Maxterm & Minterm), Boolean expression & representation using logic gates, Karnaugh map: K-map, mapping and minimization of SOP and POS expression, conversion from SOP to POS and POS to SOP form using K-map, Minimization of multiple output circuits	
III.	**Combinational Circuits Design** Adder & Subtractor (Half and Full), Parallel Binary adder, BCD Adder, Code Converters, Comparators, Decoder, BCD to 7-segment Decoder, Encoders, Priority Encoders, Multiplexers, De Multiplexers.	**04**
IV.	**Sequential Circuits Elements** Introduction to sequential circuit, Flip-flop & Timing Circuits: SR latch, Gated latch, Tristate logic, Edge triggered flip-plop: - D, JK, T Flip-flop, flip-flop asynchronous inputs ,characteristic table of Flip-flop, excitation table of Flip-flop, master slave JK flip flop.	**04**
V.	**Shift Registers and Counters** Shift registers: buffer register, controlled buffer register. Data transmission in shift resistor, Bidirectional shift register, and universal shift registers. Counter: Ripple or asynchronous counter, up-down counter, Design of Mod-n counter, synchronous counter, Ring counter, Johnson counter.	**04**
VI.	**Logic Families and Memory Technology** Digital IC specification terminology, Logic families: TTL, CMOS families, comparison of TTL& CMOS, Memory Technology: Memory organization, Classification of Memory.	**04**
Text Books		
1.	A. Anand Kumar, Fundamentals of Digital Circuits. PHI Publications	
2.	R.P. Jain, Modern Digital Electronics'.IIIrd Edition- Tata Mc Graw Hill, Publication	
Reference Books		
1.	M. Morris Mano .Digital Design (Third Edition). PHI Publications	
2.	Willim I. Fletcher. An Engineering Approach to Digital Design. PHI Publication	

Shivaji University, Kolhapur

Department of Technology

B.Tech (Food Technology), Exit After First Year (Certificate Course in Food Technology)

Teaching & Evaluation Scheme

S.N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1	SWAYAM (NPTEL) or any other MOOCs Or In face to face mode (Program Core Courses)	CC-FT 1	Food Processing and Preservation	02	-	-	02	02	30:70	00:00
2		CC-FT 2	Nutrition and Dietetics	02	-	-	02	02	30:70	00:00
3	Program Based Internship	CC-PBI	Industrial Internship	One Month				04	00:00	50:50
							-	**08***	**200**	**100**
			Total Hours	**04**	**-**	**-**	**04**	**-**		

Note: The Workload against the Certificate Course will be finalised at the Program Level considering the strength of the students seeking for the Certificate.
***Obtaining these credits will be in addition to 42 regular credits at First Year B. Tech**

**** There is an option for End Semester Examination either on respective MOOC platform if any or through the University System.
Note 1: The students aspiring to exit after the first year will finalise the title of the course/MOOC from the list provided by the Program.
Note 2: Program Specific Industry Internship to be completed by such students before commencement of S.Y. B. Tech.

Year, Program, Semester	First Year B.Tech (Food Technology), Part I, During Semester I & II				
Course Code	CC-FT I				
Course Category	Certificate in Food Technology				
Course title	Food Processing and Preservation				
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**	**Total Credits**
	02	-	-	02	02
Evaluation Scheme	**ISE:30**		**ESE: 70**		**Total=100**
Pre-requisites (if any)	Prerequisites for this course typically include a solid background in Food science and Technology including topics like food composition, food spoilage organisms, and food processing machinery. Basic understanding of physics principles, such as thermodynamics and fluid mechanics, is also helpful. Familiarity with engineering fundamentals and problem-solving skills is advantageous.				
Course Rationale	The course provides food preservation and processing techniques. It aims to equip students with the foundational knowledge and skills necessary to understand and apply the various preservation and processing techniques to solve and develop new products in food processing industries.				
Course Objectives	1.Understand the importance of food preservation and processing in food industries 2.Learn the principles of food preservation methods to solve problems in food stability 3.Think about new food processing techniques to preserve and development of new food products 4.Demonstrate the causes of food spoilage and the effective techniques to reduce the spoilage				
Course Outcomes	1.Apply preservation techniques to improve the shelf life of food products and reduces the production of waste 2.Assess the effect of different food processing techniques to develop new products 3. Know the application of unit operations in food processing industries. 4.Design processing and preservation technologies to solve the problems				

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	1	2		2	2	2		2		1	1
CO 2	3	2	3	1	2	2			2		2	1
CO 3	3	1	1		3	2			1		1	1
CO 4	3	3	3		1	2			1		1	1

Level of Mapping as: Low 1, Moderate 2, High

Unit No.	Course Content	Hours
I..	**Introduction to Food Science :** • Classification of Food • Functions of Food • Composition of Food • Types of Food Quality	**04**
II.	**Food Spoilage :** • Introduction to food spoilage • Types and causes of food spoilage • Physicochemical changes in food • Microbial changes in food	**04**
III.	**Food Preservation** : • Importance of Food Preservation • Principle of Food Preservation • Preservation of Food by thermal method • Preservation of food by Non thermal method	**04**
IV.	**Food Processing:** • Introduction to Food Processing • Importance of Food Processing • Classification of Food Processing Methods • Unit operations in Food Processing Industry	**04**
V.	**Processing and Preservation of fruits and Vegetable :** • Spoilage of fruits and vegetables • Importance of Fruits and Vegetable preservation • Methods of Fruits and Vegetable preservation • Processing of Fruits and vegetable by products	**04**
VI.	**Processing and Preservation of Milk and Milk Products :** • Spoilage of Milk and Milk Products • Importance of Fruits and Vegetable preservation • Methods of Fruits and Vegetable preservation • Processing of Fruits and vegetable by products	**04**

Reference Books	
1.	Sivasankar, B. (2002). Food processing and preservation. PHI Learning Pvt. Ltd.
2.	Fellows, P. J. (2022). Food processing technology: principles and practice. Woodhead publishing.
3.	Zeuthen, P., & Bogh-Sorensen, L. (Eds.). (2003). Food preservation techniques. Elsevier.
4.	Smith, J. S., & Hui, Y. H. (Eds.). (2008). Food processing: principles and applications. John Wiley & Sons.
5.	Desrosier, N. W., & Desrosier, J. N. (1977). The technology of food preservation (No. Ed. 4). AVI Publishing Company, Inc.
Important web links	
1.	https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=iWHzbXYGExXDS52DSnAzdQ==
2.	https://www.britannica.com/topic/food-preservation

Year, Program, Semester	First Year B.Tech (Food Technology), Part I, Semester I & II				
Course Code	CC-FT 2				
Course Category	Certificate in Food Technology				
Course title	Nutrition and Dietetics				
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**	**Total Credits**
	02	-	-	02	02
Evaluation Scheme	**ISE:30**		**ESE: 70**		**Total=100**
Pre-requisites (if any)	Prerequisites for this course typically include a solid background in Food science including topics like Role of food, Nutrients in food, Metabolism. Basic understanding of chemistry and biology are also helpful.				
Course Rationale	The course provides knowledge about the basic concepts of food nutrients and its roles. It aims to equip students with the foundational knowledge necessary to understand the concept of nutrients and promote better nutrition to people.				
Course Objectives	1.Understand the basic concept of nutrition 2.Learn the types and importance of different nutrients 3.Think and Design the diet plan according to requirements 4. Demonstrate the effect of nutrient deficiency on human health and preventive action by diet plan.				
Course Outcomes	1.Interpret the role of different nutrients 2.Know the importance of dietary management 3.Asses the nutrient deficiency and its treatment 4.Design the diet plan for human health				

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1		3	2	2	2	1						2
CO 2	1		1	2	1	3	2	2	1	1		3
CO 3	1	3	3	2	2	1	1	1	1			2
CO 4	1	2	3	2	2	1			1			1

Level of Mapping as: Low 1, Moderate 2, High

Unit No.	Course Content	Hours
I.	**Food and Nutrition:** • Classification of Food • Classification of Nutrients in Food • Importance of Nutrients • Food Pyramid	**04**
II.	**Body Composition and Energy Balance :** • Body Composition and Function • Body size and composition data in nutrition • Energy Intake • Energy Expenditure	**04**

III.	**Major Dietary Component** : • Carbohydrates and Its Metabolism • Fats and Its Metabolism • Proteins and Its Metabolism • Water Balance and Requirements	**04**
IV.	**Minor Dietary Component :** • Water Soluble Vitamins • Fat Soluble Vitamins • Minerals and Trace Elements • Phytochemicals	**04**
V.	**Diet Planning and Nutrition :** • Classification of balanced diet • Preparation of balanced diet for groups • Diets and disorders • Recommended dietary allowances for various age groups	**04**
VI.	**Diet Planning and Nutrition :** • Nutrition During Pregnancy • Nutrition during Lactation • Diet for Sports and Exercise • Diet for Sports and Disease	**04**

Reference Books

1.	Geissler, C., & Powers, H. J. (Eds.). (2017). Human nutrition. Oxford University Press.
2.	Mann, J., & Truswell, A. S. (Eds.). (2017). Essentials of human nutrition. Oxford University Press.
3.	Gibney, M. J., Lanham-New, S. A., Cassidy, A., & Vorster, H. H. (Eds.). (2013). Introduction to human nutrition. John Wiley & Sons.
4.	Eastwood, M. A. (2013). Principles of human nutrition. Springer.
5.	Barasi, M. (2003). Human nutrition: a health perspective. CRC press.

Important web links

1.	https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=iWHzbXYGExXDS52DSnAzdQ==
2.	https://www.nin.res.in/downloads/DietaryGuidelinesforNINwebsite.pdf

Shivaji University, Kolhapur

Department of Technology

B.Tech (Mechanical Engineering), Exit After First Year (Certificate Course in Mechanical Engineering)

Teaching & Evaluation Scheme

S.N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	SWAYAM (NPTEL) or any other MOOCs	CC-ME 1	Fundamentals of Mechanical Engineering	02	-	-	02	02	30:70	00:00
2.	Or any other course from in face to face mode (Program Core Courses)	CC-ME 2	Manufacturing Technology	02	-	-	02	02	30:70	00:00
3.	Program Based Internship	CC-PBI	Industrial Internship	One Month				04	00:00	50:50
				-	-	-	-	**08***	**200****	**100**
			Total Hours	**04**	**-**	**-**	**04**	**-**	**-**	**-**

***Note: The Workload against the Certificate Course will be finalised at the Program Level considering the strength of the students seeking for the Certificate.*Obtaining these credits will be in addition to 42 regular credits at FY B. Tech**

**** There is an option for End Semester Examination either on respective MOOC platform if any or through the University System.

Note 1: The students aspiring to exit after first year will finalise the title of the course/MOOC from the list provided by the Program.

Note 2: Program Specific Industry Internship to be completed by such students before commencement of SY B. Tech.

Year, Program, Semester	First Year B. Tech (Mechanical Engineering), Part I, Semester I & II				
Course Code	CC-ME 1				
Course Category	Certificate in Mechanical Engineering				
Course title	Fundamentals of Mechanical Engineering				
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**	**Total Credits**
	02	-	-	02	02
Evaluation Scheme	**ISE:30**			**ESE: 70**	**Total=100**
Pre-requisites (if any)	Prerequisites for this course typically include a basic understanding of physics principles, such as thermodynamics and fluid mechanics. Familiarity with engineering fundamentals and problem-solving skills is advantageous.				
Course Rationale	The course provides a comprehensive introduction to the core principles and concepts of Mechanical Engineering. It aims to equip students with the foundational knowledge and skills necessary to understand and analyze Mechanical processes, perform mass and energy balances, and apply engineering principles to solve problems in the field of Mechanical Engineering.				
Course Objectives	1. Apply Mechanical engineering principles to analyze and solve engineering problems in various process industries. 2. Evaluate and interpret mass and energy balances in Mechanical systems using quantitative analysis techniques. 3. Demonstrate and understanding of the thermodynamics concept and its application to Mechanical processes. 4. Demonstrate and understanding of various components under static and dynamic loads.				
Course Outcomes	1. Apply Mechanical engineering principles to solve complex engineering problems in diverse process industries. 2. Analyze and interpret mass and energy balances in Mechanical systems. 3. Explain the application of several of Mechanical Engineering processes. 4. Evaluate and propose various components of I C Engine and Refrigeration for improving performance.				

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3		2								
CO 2		3	2	2								
CO 3	3		2									
CO 4			2		2							

Level of Mapping as: Low 1, Moderate 2, High

Unit No.	Course Content	Hours
I.	**Introduction to Mechanical Engineering:** • Overview of Mechanical engineering principles, scope, and applications • Fundamentals of Mechanical processes, unit operations, and process flow diagrams • Introduction to thermodynamics and its application in Mechanical engineering • Overview of safety considerations and ethical responsibilities in Mechanical engineering	**04**

II.	**Engineering Thermodynamics:** • Laws of thermodynamics and their relevance • Application of thermodynamics to analyze and predict phase behaviour in chemical processes	**04**
III.	**Internal Combustion Engines and Refrigeration:** • Introduction and Classification of IC Engine, construction and working of two and four-stroke • Petrol and diesel engines with air standard cycles (Otto and Diesel Cycle) • Refrigeration Cycles and Systems: Reverse Carnot cycle – Coefficient of Performance, • Vapour compression refrigeration and Vapour absorption refrigeration cycle and system • Applications of Air conditioning and Refrigeration	**04**
IV.	**Heat and Mass Transfer:** • Principles of heat transfer and its application in chemical engineering • Conduction, convection, and radiation heat transfer mechanisms • Mass transfer fundamentals and its relevance in chemical processes • Design and analysis of heat exchangers and mass transfer equipment	**04**
V.	**Power Transmission Devices, Pumps, Compressor and Turbines:** • Types of Belts and belt drives, Chain drives, Types of gears: Types, Construction, working and applications • Pumps: Types, Construction, working and applications • Compressor and Hydraulic Turbines: Types, Construction, working and applications	**04**
VI.	**Introduction to Manufacturing Technology:** • Introduction to Manufacturing Processes and their Applications • Casting, Sheet metal forming and metal joining processes	**04**

Reference Books

1.	T. S. Rajan, Basic Mechanical Engineering, New Age International Publishers.
2.	P. K. Nag, Engineering Thermodynamics, Tata McGraw Hill Pub. Company Limited, New Delhi
3.	S.S.Rattan, Theory of Machine, Tata McGraw Hill, New Delhi
4.	Hajara Chaudhari S.K., Workshop Technology, Vol. I and II, Media Prom and Publication, Mumbai.
5.	Bhandari V.B., Design of Machine Elements, Tata McGraw Hill Publication Co. Ltd.
6.	Shigley J.E. and Mischke C.R., Mechanical Engineering Design, McGraw Hill Publication Co. Ltd
7.	V. Ganesan, Internal Combustion Engines, Tata McGraw Hill, Second Edition.

Year, Program, Semester	First Year B. Tech (Mechanical Engineering), Part I, Semester I & II				
Course Code	CC-ME 2				
Course Category	Certificate in Mechanical Engineering				
Course title	Manufacturing Technology				
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**	**Total Credits**
	02	-	-	02	02
Evaluation Scheme	**ISE:30**			**ESE: 70**	**Total=100**
Pre-requisites (if any)	Familiarity with engineering fundamentals and problem-solving skills.				
Course Rationale	The course provides a comprehensive introduction to the core principles and concepts of manufacturing process in Mechanical engineering. It aims to equip students with the foundational knowledge and skills necessary to understand and analyze manufacturing process and apply engineering principles to solve problems in the field of Mechanical Engineering.				
Course Objectives	1. To study fundamental methods of manufacturing with reference to hot and cold forming. 2. To study various joining methods such as welding, adhesive joining. 3. To study foundry technology fundamentals with conventional and advanced casting methods. 4.To study construction, working and applications of various machine tools				
Course Outcomes	1. Distinguish between hot and cold working processes on fundamental and application part. 2. Numerically solve the problems on the welding processes. 3. Classify various casting processes and design the gating system for simple objects. 4. Summaries and correlate various machine tools for their applications for manufacturing of any component.				

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3		2								
CO 2		3	2	2								
CO 3	3		2									
CO 4			2		2							

Level of Mapping as: Low 1, Moderate 2, High

Unit No.	Course Content	Hours
I.	**Hot and cold working of metals Hot and cold working**: • Principles of rolling, forging, drop, press, upset, roll forging, extrusion, drawing, spinning, and effect of hot working. • Cold working processes, Cold rolling, swaging, forging, extrusion forward, backward and impact roll forming, tube drawing, wire drawing, spinning, shot penning, high energy rate forming, sheet metal working, types of presses, drives, different operations and types of dies.	**04**
II.	**Joining processes:**	**04**

	• Introduction, classification of joining processes • Arc welding- Theory, SMAW, GTAW, GMAW, FCAW, Submerged arc welding, Stud welding, Resistance welding- Theory, spot and seam projection welding processes, Gas welding Friction welding, Ultrasonic welding, Thermit welding, EBW and LASER welding • Use of adhesive for joining, classification of adhesives, types of adhesive and their application, surface preparation and various joints • Welding defects and quality control in welding	
III.	**Foundry- Pattern making, moulding and casting:** • Importance of casting as manufacturing process, advantages and disadvantages of casting processes, foundry layouts and mechanization • Introduction to patterns, core boxes and gating systems: types of patterns, pattern materials, pattern-making allowances, core boxes, core making, core prints, components of gating system, functions and importance of runners and risers, solidification control devices: chills, ceramics bricks, progressive and directional solidification, sand properties • Hand and machine moulding • Melting and pouring - melting furnaces- Cupola, fuel fired electric arc and induction furnaces. Cleaning, finishing of casting, casting defects. • Advanced casting methods: Lost wax processes, shell moulding and investment casting. Permanent mould dies casting- Die-casting, low-pressure permanent mould casting, hot and cold chamber processing, centrifugal casting, semi-centrifugal casting and continuous casting.	**04**
IV.	**Lathe and drilling machine:** • Working principles, types, specifications, principal parts, accessories and attachments, lathe construction. Concept of speed, feed and depth of cut, thread cutting operation. • Introduction to boring Machines, Capstan and Turret lathe. • Fundamentals of drilling processes, hoist, drill geometry, tool holder, types of drilling machines, operations performed on drilling machines, type of drill. • Reaming processes and reamer types.	**04**
V.	**Milling, shaping, planning and broaching:** • Fundamental aspects, cutter types and geometry, Operations performed on a milling machine, dividing head method of indexing. • Construction, working and operations performed on shaper, planer, and broaching machines	**04**
VI.	**Grinding:** • Classification, grinding wheels, wheel marking, wheel selection, wheel mounting, wheel balancing, Grinding wheels- Abrasives, bonds and bonding processes, grit, grade and structure of wheel, types of grinding machines. • Honing, lapping, super finishing, buffing and burnishing processes.	**04**

Reference Books

1.	Chapman W.A. Workshop Technology, Vol. II, III, and I, Edward Arnold Pub. Ltd. London
2.	Hajra Chaudhary S.K. Elements of Workshop Technology, Vol. I and II, Media Prom and Pub, Mumbai
3.	S.Klpakjim, S.R. Schmid, Manufacturing Processes for Engineering Materials, Pearson Education
4.	M.P. Groover, Fundamentals of Modern Manufacturing, Wiley India Pvt. Ltd.
5.	P L Jain, Principles of foundry technology, Tata McGraw-Hill, New Delhi
6.	P. C. Sharma., Production technology, S. Chand and Company Ltd.,